Conquering the "Unknowns"

Research and Recommendations on the Chronic Problem of Undetermined and Missing Data in the Causal Factors Sections of the National Fire Incident Reporting System

National Association of State Fire Marshals Fire Research & Education Foundation

Award No. EMW-2011-FP-00356

Assistance to Firefighters Fire Prevention & Safety Grant Program

Federal Emergency Management Agency

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Executive Summary

With the help of a Fire Prevention & Safety Grant from the Assistance to Firefighters Grant Program of the Federal Emergency Management Agency to the National Association of State Fire Marshals Fire Research and Education Foundation, the NASFM Foundation focused on addressing the problem of "unknowns" in the National Fire Incident Reporting System (NFIRS): specifically, undetermined and/or missing data about causes of fires in NFIRS. This problem seems to be especially prevalent for more serious fires, particularly those involving fatalities. Without a true picture of the fire problem, decisions based on NFIRS data will be negatively affected, from the local level through the national level. Resource allocation, hazard and risk identification, development of targeted prevention programs, and determination of training priorities are just a few of the activities that are hampered by inadequate causal data.

The goals of the NASFM Foundation project, entitled "Conquering the Unknown: Addressing Undetermined and Unknown Origin & Cause Entries in Fire Incident Reporting," were threefold:

1. Obtain a much better understanding of why a large percentage of the area of origin of fires are being reported as Undetermined or left blank, and the causal elements of the fires are being reported as Undetermined, or not reported at all, or inappropriately coded as "none" in fire incident data.

2. Report on findings, with an emphasis on strategies for how departments can overcome barriers to more effective fire data reporting.

3. Identify gaps that may exist in available resources to educate and train fire department personnel on complete and accurate recording and reporting of fire data, and create a plan for developing/updating needed resources in the future.

The deliverables of the project were as follows:

1. **Appoint Advisory Committee.** An Advisory Committee was appointed to help guide the project and review/comment on the other deliverables.

2. **Collect fire department policies, guidelines, and communications on fire incident data collection.** We gathered information on fire departments' policies and guidelines regarding data collection. This was done in order to get a better understanding of how fire departments were approaching the process, and 13 organizations provided material.

3. **Conduct in-depth interviews with personnel who input fire incident data.** A series of telephone interviews with 20 fire departments across the country was conducted to better understand the issues and to help define questions for the online survey. We sought to identify a representative cross-section of departments (urban, rural, geographic distribution, full-time, volunteer, call), as well as departments that had either "high" data

quality or "low" data quality, based on rankings provided by the U.S. Fire Administration.

4. **Administer online survey to confirm issues from in-depth interviews.** An online survey tool was developed and distributed nationally via Survey Monkey through State Fire Marshals and State NFIRS Program Managers to fire departments throughout the United States. Just short of 3,500 departments responded to this survey from forty-three states, providing a wealth of information on data collection methods and attitudes.

5. **Conduct in-depth interviews with data specialists in non-fire professions.** By interviewing representatives from non-fire organizations that collect incident data, we sought to gain insight into strategies that could be employed in NFIRS. The data systems we looked at were the Uniform Crime Reporting System, the Bomb Arson Tracking System, the National EMS Information System, the National Burn Registry, the Multiple Listing Service Database, and the National Center for the Review & Prevention of Child Deaths.

6. **Compile an electronic toolkit of existing resources and guidance for first responders to improve origin and cause reporting.** In order to point fire departments in the direction of free and low-cost resources to assist with both NFIRS data reporting and analysis, as well as entry-level instruction on origin and cause determinations, we have compiled an Electronic Toolkit. It is provided in two formats: an e-Book format and a tabular format.

7. **Identify gaps in available information and plan to create/update resources.** The report identifies gaps/problems and presents associated recommendations in order to address them.

8. **Report and disseminate findings and recommendations.** The findings and recommendations from this research will be disseminated broadly throughout the fire services during the first quarter of 2014. The report, along with appendixes and related information, is also posted on the NASFM website at http://firemarshals.org/resources/fireincidentdatacollectionresearch.html.

We heard many reasons, opinions and observations offered throughout the course of our research for why causal data in NFIRS is lacking. Some of them are cultural, others are resource-driven; some reflect deficiencies in training or knowledge, others reflect deficiencies in the data system or interface with the system; some are human nature, others are institutional; some may be more easily addressed than others.

Based on our research, we have identified five gaps/problems that are creating barriers to more complete reporting of fire incident data, and have paired each gap/problem with corresponding recommendations and strategies with which the recommendations could be met. Some of them may be easily implemented; others will require commitment, effort – and substantial funding – to carry out. These strategies are intended to be a starting point for further discussions and idea generation for how to address these problems and carry out the recommendations.

- **Problem: Available information about investigated fires (often those that result in greater loss) is too often not included or underreported in NFIRS.**
Recommendation 1: Close the Loop. Whether a cause is determined or remains undetermined after investigation, fire departments must "Close the Loop" by updating the codes in the NFIRS incident report. Simply attaching the investigation report to the incident report does not allow for the causal information to be included in NFIRS analyses -- the codes need to be updated in the system once a cause is determined. "Under Investigation" reports should always be revisited and updated after the investigation. Possible strategies to "Close the Loop" are identified in the report.

- **Problem: Some incomplete data for cause and origin reflects a hesitation to declare a cause due to liability concerns.**

   Recommendation 2: **Clear the Litigation Cloud.** Address the liability concerns through a multi-pronged approach consisting of providing fire departments with an option of indicating a level of certainty that underlies causal determinations; obtaining a formal interpretation of NFPA 921 Guide for Fire and Explosion Investigations to clarify levels of certainty for determining cause of different types of fire incidents; providing immunity from liability for persons or entities who report fire incident data while acting "in good faith and without malice"; exploring whether incident reports and investigation reports are treated differently in lawsuits and courtrooms, to clarify the question of whether it makes sense to draw a distinction between the two types of reports in terms of determining cause; and forming region-wide Fire Investigation Teams to collaborate by sharing expertise and resources so that fire investigations and cause determinations do not fall to one individual.

- **Problem: NFIRS training is not effectively conveying to front line firefighters the importance of data collection. A common sentiment expressed was that NFIRS reports end up in a "Black Hole."**

   Recommendation 3: Fill the Black Hole. Training for chiefs, officers and front-line personnel on the concepts and reasons behind the need for reporting, as well as how fire incident data can be used to advance fire prevention and suppression goals is needed. Because the fire service devotes a great deal of time to training, alternative training formats (such as on-line, video, smartphone app) should be explored. The training should be offered at no cost. As a direct result of the preliminary findings of this project, NASFM was awarded a subsequent DHS Fire Prevention and Safety Grant to develop training material for firefighters and chief officers that will focus on the value and importance of data. The training will be offered to fire departments at no cost, and is expected to be made available in the second half of 2014.

- **Problem: The current NFIRS system is viewed as overly complex and not user-friendly.**

   Recommendation 4: If the System Is Broke, Fix It. Develop and implement the next generation of NFIRS – what is commonly referred to as NFIRS Version 6.0. This process

should include input from stakeholders – those who are tasked with inputting the data at the local level, as well as those who analyze and use the data at all levels. It should take advantage of modern technology and accommodate the diversity of fire departments' capacities. The report recommends features and characteristics to consider in the redesign.

- **Problem: Protocols and systems to improve Quality Assurance and Quality Control in fire incident reporting are needed.**

  Recommendation 5: Put In Quality Data, Take Out Quality Data. This is the antidote to "Garbage In-Garbage Out." Specific systemic changes to improve quality assurances and quality control include designating a "Data Champion" to be responsible for NFIRS quality control/quality assurance; providing a mechanism for departments to report "no incidents" periodically; emphasizing the importance of dedicated State NFIRS Program Managers to work with departments in their state; adopting a Standard Operation Procedure or Standard Operating Guideline (SOP/SOG) on completing incident reports; and revitalizing the National Fire Information Council (NFIC) with a focus on developing strategies and training to improve the quality of the nation's NFIRS data.

There will always be fires whose cause cannot legitimately be determined even after investigation. We further caution that a policy that says "Thou shalt not have unknowns" would do much more harm than good, and we are not recommending such an approach.

For many incidents, however, we believe that definite steps can be taken toward reducing the level of "undetermined" or unreported responses in the causal factors section of NFIRS. To achieve this will require confronting some difficult, thorny issues that do not have clear solutions. But, *If you don't write it down, it didn't happen,* and we may never be able to quantify what has been lost by not having sufficient data on the causes of fires.

While NFIRS is an imperfect system, it is what we have as documentation of the fire problem in the United States, and it is better to have it than not. It behooves all of us to work toward improving the system, our appreciation of the need for data collection, and the accuracy with which reports are completed.

Introduction

If we don't have numbers, we have nothing.

If you don't write it down, it didn't happen.

The job is not done until the paperwork is done.

Garbage in, garbage out.

What gets measured, gets fixed.

These common expressions of the importance of good record-keeping are often applied to the collection of fire incident data. While certainly a great deal of fire data is being collected and reported accurately, we believe that a substantial amount is being inaccurately reported or not reported at all, leading to an incomplete and possibly misleading picture of the fire problem in the United States.

The National Association of State Fire Marshals (NASFM), whose principal members are the senior state fire officials in the U.S., has a primary mission of protecting human life, property and the environment from fire and related hazards; and a secondary mission of improving the efficiency and effectiveness of State Fire Marshals' operations. With the help of a Fire Prevention & Safety Grant from the Assistance to Firefighters Grant Program of the Federal Emergency Management Agency to the NASFM Fire Research and Education Foundation, the NASFM Foundation focused on addressing the problem of "unknowns" in the National Fire Incident Reporting System: specifically, undetermined and/or missing data about causes of fires.

The goals of the NASFM Foundation project, entitled "Conquering the Unknown: Addressing Undetermined and Unknown Origin & Cause Entries in Fire Incident Reporting," were threefold:

1. Obtain a much better understanding of why a large percentage of the area of origin of fires are being reported as Undetermined or left blank, and the causal elements of the fires are being reported as Undetermined, or not reported at all, or inappropriately coded as "none" in fire incident data.

2. Report on findings, with an emphasis on strategies for how departments can overcome barriers to more effective fire data reporting.

3. Identify gaps that may exist in available resources to educate and train fire department personnel on complete and accurate recording and reporting of fire data, and create a plan for developing/updating needed resources in the future.

The deliverables of the project were as follows:

1. Appoint Advisory Committee: An Advisory Committee was appointed to help guide the project and review/comment on the other deliverables. Advisory Committee members

included representatives from the U.S. Fire Administration, the National Fire Protection Association (NFPA) Fire Data and Research Analysis Division, the International Association of Arson Investigators, and State NFIRS Program Managers in California, Maine, New Hampshire, New Jersey, South Carolina and Tennessee.

2. Collect fire department policies, guidelines, communications on fire incident data collection

3. Conduct in-depth interviews with personnel who input fire incident data

4. Administer online survey to confirm issues from in-depth interviews

5. Conduct in-depth interviews with data specialists in non-fire professions

6. Compile an electronic toolkit of existing resources and guidance for first responders to improve origin and cause reporting

7. Identify gaps in available information and plan to create/update resources

8. Report and disseminate findings and recommendations

This report describes how we achieved these deliverables and the results of our research. We summarized the main themes that we found, with the caveat that no generalizations or summaries apply to all departments; there will always be situations and departments that do not fit a particular description. We also acknowledge that we are not the first to discuss any of these issues, though few have addressed them to the extent that we have sought to do in this report.

Similarly, our recommendations are not "one size fits all," but rather a mix of ideas and suggestions to address gaps and problems we identified through this research. No single solution will "fix" everything, and some are more feasible in the short term, or more easily implemented, than others. But it is clear that in the big picture, to make NFIRS the best database it can be, changes must be made to the system, as well as by those who input data into the system.

We hope that this report results in discussions at the federal, state and local levels that result in many more ideas on how best to address the gaps, problems and issues that lead to undetermined and missing data in the causal factors sections of NFIRS.

Background on the Need for a National Fire Data Collection System

The U.S. government has been collecting fire incident data for less than four decades, though the need for it was recognized long before that. The President's Conference on Fire Prevention, convened by President Harry S. Truman in May 1947, brought together a blue-ribbon panel of leaders from business, industry, government, military, higher education and the fire service, with active participation by the President himself, to determine how best to prevent unwanted fires. Among the many recommendations that came from this extensive and remarkable report were several under the heading of "Research," including "The need for ready availability of information, complete and up to date, pertaining to the subject of fire prevention, fire protection, *fire loss experience* and research developments is emphasized; a central library facility would serve this need" (President's Conference, 1947, p. 8 [emphasis added]). At that time, however, the establishment of a new agency to address such concerns was neither anticipated nor called for.

Not until 1973 and the publication of the landmark report *America Burning* (for which another distinguished panel of influential stakeholders convened under the umbrella of the National Commission on Fire Prevention and Control) was the fire problem addressed in concrete ways and steps toward a uniform national fire incident data collection system were taken. *America Burning* acknowledged that "lack of understanding of fire's threat helps to account for the low priority given fire protection" (America Burning 1973, p. 2), and called for a U.S. Fire Administration that, among other things, would "help place solutions to the fire problem on a firmer foundation of scientific data" (p. 9). The Commission found that existing sources of fire incident data were piecemeal at best, and acknowledged "an appalling gap in data and information that effectively separated us from sure knowledge of various aspects of the fire problem" (p. 9). The Commission recommended "that a national fire data system be established to provide a continuing review and analysis of the entire fire problem" (p. 9) that should be housed and administered within the proposed U.S. Fire Administration. As an incentive for reporting, the Commission recommended that "Federal assistance in support of State and local fire service programs be limited to those jurisdictions complying with the National Fire Data System reporting requirements" (p. 141).

The National Fire Incident Reporting System, or NFIRS, was authorized by the Federal Fire Prevention and Control Act of 1974 (Public Law 93-498), which established the U.S. Fire Administration (originally called the National Fire Prevention and Control Administration). The stated purpose of the establishment of the National Fire Data Center from the legislation was "for the selection, analysis, publication, and dissemination of information related to the prevention, occurrence, control, and results of fires of all types. The program of such Data Center shall be designed to (1) provide an accurate nationwide analysis of the fire problem, (2) identify major problem areas, (3) assist in setting priorities, (4) determine possible solutions to problems, and (5) monitor the progress of programs to reduce fire losses" (P.L. 93-498, Sec. 9(a)). The USFA would also be responsible for disseminating the collected fire data and sharing it with "Federal agencies, State and local governments, private organizations, industry, business, and other interested persons" (P.L. 93-498, Sec. 9(c)).

The development of NFIRS relied heavily on data collection work conducted by the National Fire Protection Association (NFPA) since the 1930s. NFIRS adopted most of the standard reporting terminology and codes developed by NFPA and contained in the NFPA 901 standard, the "Uniform Coding for Fire Protection" as well as prototype reporting forms developed by the 901 Committee. Data collection began in 1975 with the NFIRS Users Conference. The NFIRS software has gone through several versions (NFIRS PM-Student Manual 2007, p. 1-9):

- Version 1, introduced in 1975
- Version 2, completed between 1976 and 1978
- Development of Version 3 began in 1979
- Development of Version 4 began in 1985
- Version 5.0, which is the software currently in use, began development in 1989 and was released in 1999.

Each year since 1999, there have been small, incremental changes made in the current version of NFIRS 5.0, which is a move away from the paper-based system that primarily was used in prior versions. Its development reflected an increasingly computer-driven society, and sought to take advantage of the efficiencies and additional analysis that were possible with a computer-based system. However, it also requires a level of computer literacy that some fire departments still have not achieved.

What Is NFIRS, and How Is Data Submitted Into the System?

NFIRS is a voluntary reporting system that was set up to collect incident data from local fire departments submitted to state fire protection agencies, which would compile and validate the local data, consolidate it into a computerized database and then provide it to the National Fire Data Center, where it would be included in the national NFIRS database. This process is followed in some states, and not in others.

In many cases, data collection starts on the scene with the designated personnel (the company officer in charge at the incident, for example) filling out a paper "run sheet" or "field notes" form about the incident that answers some of the basic questions posed by NFIRS. Examples of field notes forms that are made available by State Fire Marshal offices are in Appendix 1. From there, this information is used as a basis for the data entered into the NFIRS electronic system.

The method by which local fire incident information is conveyed to the federal NFIRS database varies from state to state. NFIRS 5.0 was developed so that data could be submitted directly via the Internet, moving away from a paper-based system entirely (as previously noted, this did create some issues that linger today regarding computer literacy on the part of the person doing the data entry). USFA offers NFIRS 5.0 data entry software or online web-based reporting at no cost to the state and local levels. The NFIRS web-based Client Data Entry Tool must be downloaded onto the user's computer and, with an Internet connection and a user name/password, fire departments can input fire incident data and upload it directly to NFIRS. USFA also offers the Data Entry Browser Interface (DEBI), a tool that enables registered fire departments with a computer and Internet connection to accomplish web-based data entry directly into NFIRS, eliminating the need to download and install client software on the NFIRS user's computer.

Fire departments can also obtain NFIRS-compatible commercial software for a fee. Currently there are more than 100 active NFIRS vendors listed, including metropolitan fire departments that developed their own data collection systems (www.nfirs.fema.gov/system/activevendors.shtm). Active vendors are those who have notified the USFA that they have developed their software according to NFIRS specifications and have used the NFIRS Validation Tool to test their output files to ensure that their product is compatible with the national NFIRS 5.0 database standard. Changes to NFIRS design specifications are released annually in September of each year that will take effect on January 1 of the following year, in order to give vendors three months to incorporate the changes and distribute updates to their clients.

Many states provide commercial reporting software for their fire departments to use.

Fire department identification numbers (FDIDs) are assigned by the State NFIRS Program Managers to fire departments to enable their participation in NFIRS. State Program Managers are also tasked with supporting the efforts of fire departments that participate in the system, managing the state system, providing quality reports and feedback to the departments in their

state, and encouraging the participation of non-reporting departments (NFIRS PM-Student Manual 2007, p. 1-5). NFIRS asks that states submit data monthly or quarterly to NFIRS. States can revise, correct and resubmit data to USFA for the previous calendar data year until the annual submission data deadline on July 1.

State NFIRS Program Managers and data analysts from large metropolitan fire departments collectively form the National Fire Information Council (NFIC), which was established by the USFA to help develop the NFIRS system, to provide specialized training to its members and to provide advice to the USFA about NFIRS. Information about NFIC can be found at http://www.nfic.org/. The USFA funded NFIC through cooperative agreements from the early 1980s through 2004 (Ahrens et al. 2008, p. 3-50), but budget cutbacks over the past decade have all but eliminated USFA funding for NFIC, so its activity and ability to conduct trainings has been significantly curtailed as a result.

Today, NFIRS is the world's largest, national, annual database of fire incident information, according to the USFA. All 50 states and the District of Columbia report NFIRS data. NFIRS can collect data from major U.S. outlying territories if they wish to participate. It is also used by the fire departments of the Department of Defense. About 23,000 out of over 30,000 fire departments participate in NFIRS each year, reporting 23,000,000 incidents and 1,000,000 fires each year. USFA estimates that the NFIRS database comprises 75 percent of all reported fires that occur annually (www.usfa.fema.gov/fireservice/nfirs/). On the other hand, NFIRS has an unstable participant base; thousands of departments drop out of NFIRS for a year or so and then return.

To help encourage participation in the system, fire departments have to agree to use NFIRS in order to receive an Assistance to Firefighter Grant from the Federal Emergency Management Agency. However, this is not monitored for compliance, so it is unknown how effective an incentive this has been over the years.

The Problem of Undetermined and Missing Cause Data

Specifying the cause of a fire in NFIRS is a multi-step process involving multiple data elements.

Step 1: The "Cause of Ignition" section within the Fire Module is a general statement of whether the cause could be the result of a deliberate act, equipment failure, or act of nature. The choices in this section are:

1. Intentional
2. Unintentional
3. Failure of equipment or heat source
4. Act of nature
5. Cause under investigation
U Cause undetermined after investigation

The NFIRS 5.0 Complete Reference Guide (Fire Module – E) states in the Cause of Ignition section, "This is the best determination of the firefighter at the scene *and may be changed later as a result of further investigation or other information*" (p. 4-24, emphasis added).

Step 2: Specific causal factors include heat source, item first ignited, factors contributing to ignition, area of origin and equipment involved in ignition. Some information can be inferred from incident types identifying specific scenarios, such as a cooking fire confined to the vessel of origin or a confined chimney or flue fire. In most USFA analyses of building fires using NFIRS data, USFA uses an algorithm (that is, a process or set of rules to be followed) on the data from the different causal factors sections to assign one overall cause to a fire using a hierarchical set of rules. NFPA generally determines cause by looking at one causal data element at a time, with the possible addition of relevant confined fire incident types when these fires are not themselves analyzed further.

Code 5, the "Cause under investigation" choice, allows fire departments to flag reports that need to be updated after the investigation is complete. Our research confirms that the extent to which incident reports are not updated from Code 5 status is a major reason why one of the leading causes of fire in the United States is "undetermined."

Every edition of *Fire in the United States* (the U.S. Fire Administration's report of the fire problem in the country based on incident data submitted through NFIRS) has included language that addresses the problem of unknown or missing data. The most recent edition, which covers NFIRS data for the years 2003-2007, states:

> On a fraction of the incident reports or casualty reports sent to NFIRS, the desired information for many data items either is not reported or is reported as 'unknown.' The total number of blank or unknown entries is often larger than some of the important subcategories. For example, **43 percent of fatal structure fires reported in 2007 do not have sufficient data recorded in NFIRS to determine fire cause** (emphasis added).

The lack of data, especially for these fatal fires, masks the true picture of the fire problem. Many prevention and public education programs use NFIRS data to target at-risk groups or to address critical problems, fire officials use the data in decision making that affects the allocation of firefighting resources, and consumer groups and litigators use the data to assess product fire incidence. When the number of unknowns are large, the credibility of the data suffers. In some cases, even after the best attempts by fire investigators, the information is truly unknown. In other cases, the information reported as unknown in the initial NFIRS report is not updated after the fire investigation is completed. Fire departments need to be more aware of the effect of incomplete data reporting and need to update the initial NFIRS report if additional information is available after investigation.

In making national estimates, the unknowns should not be ignored. The approach taken in this report is to provide not only the "raw" percentages of each category, but also the "adjusted" percentages computed using only those incidents for which data were provided. This calculation, in effect, distributes the fires for which the data are unknown in the same proportion as the fires for which the data are known, which may or may not be approximately right (Fire in the United States 2003-2007, p. 16).

The NFPA Home Structure Fires Report (Ahrens 2013, pp. 119-120) reports that for non-confined home structure fires, the cause of ignition was unknown in 30% of all fires, 57% of civilian fire deaths, 35% of civilian injuries and 43% of direct property damage (see table below).
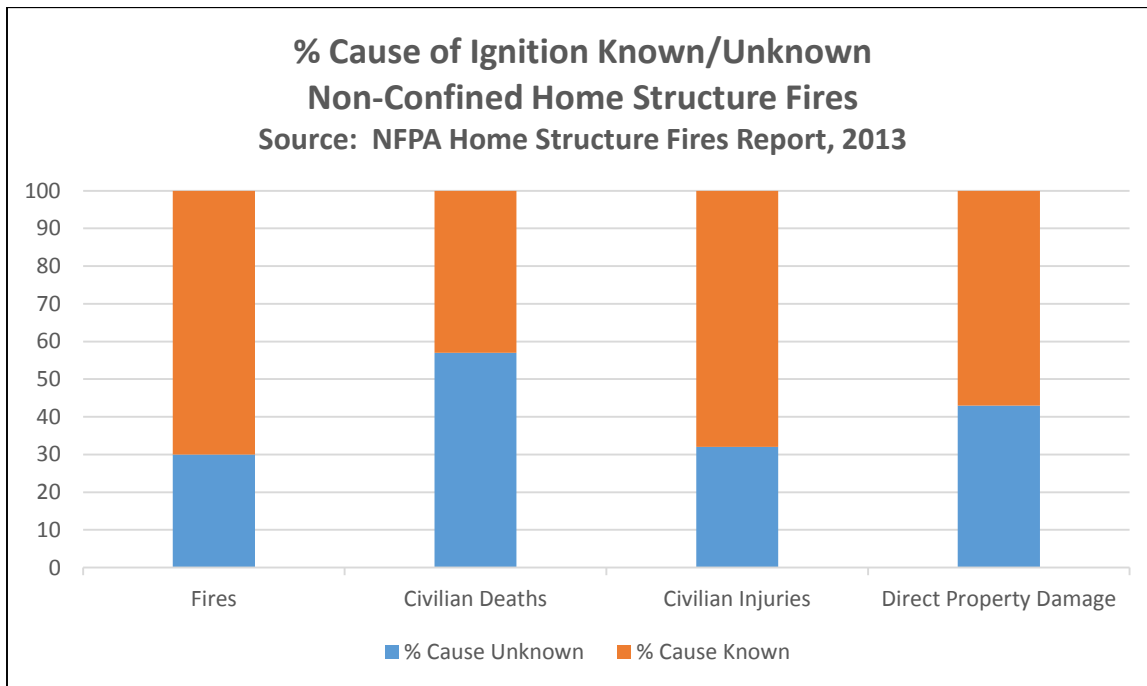
Similarly, the factor contributing to ignition in non-confined home structure fires was coded as none, undetermined or left blank in 47% of all fires, 66% of associated deaths, 45% of associated injuries, and 55% of direct property damage (see table below).

Factor contributing to ignition entered as none, undetermined or blank
Non-confined home structure fires
Source: NFPA Home Structure Fires Report, 2013
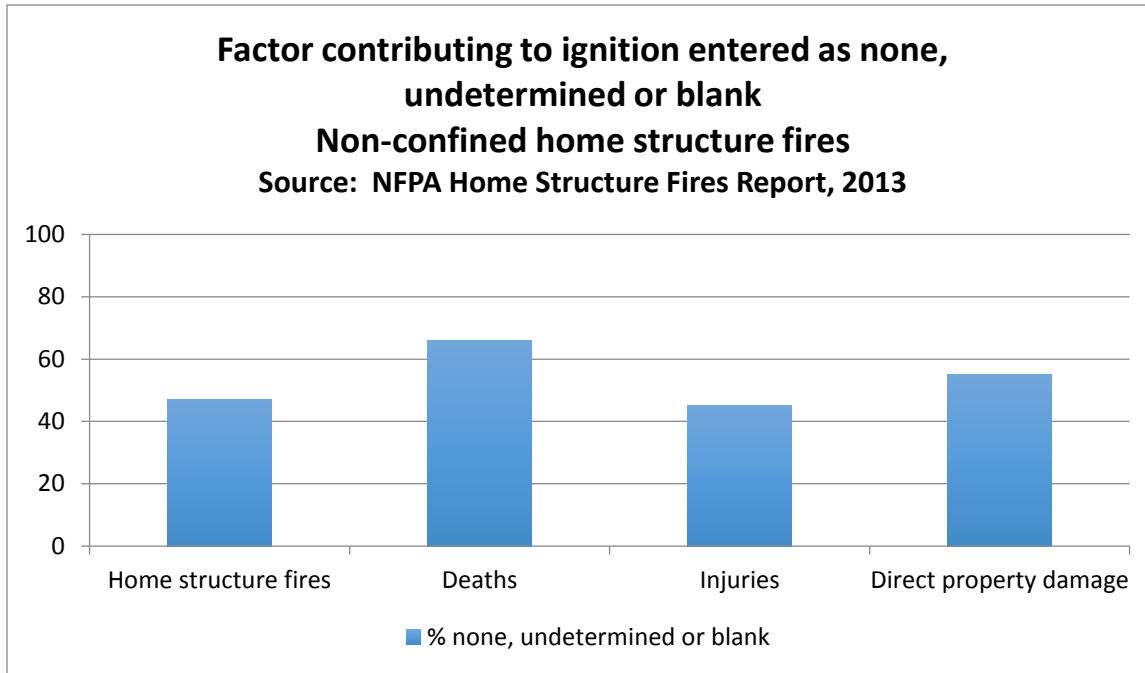
The U.S. Fire Administration's National Fire Data Center staff confirms NFPA's findings and notes that the data quality ratings for fire cause fields (taking into account "undetermined" responses and blank fields) varies with the type of incident. Overall data quality tends to be best for incidents that report injuries but no deaths, and worst for incidents involving deaths but no injuries (comments by USFA staff, project Advisory Committee meeting November 12, 2012). While this could be because fires with injuries are likely to have survivors who can provide information, it may be because incidents involving deaths are the ones most likely to be investigated and have the highest stakes in terms of determining cause. It is a troubling finding, in that the most serious fires from a life safety point of view are less reliably reported in the fire data.

It should be noted that cause of fire is not required to be reported for outside rubbish fires or for confined structure fires (that is, fires confined to the vessel of origin, such as confined cooking fires, confined chimney or flue fires, confined fuel burner or boiler fires, confined incinerator fires, confined compactor fires, and trash or rubbish fires in a structure with no flame damage to the structure or its contents). Because it is not required, cause is generally not reported for such fires (for example, NFPA's Home Structure Fires report indicates that the cause was known in only 17% of confined fires, and the factor contributing to ignition was known in only 11% of confined fires [Ahrens 2013, pp. 119-120]). Since these types of fires can have many causes and

injuries are associated with them (Miller 2013; FEMA 2006), we believe that changing the NFIRS system rules to require causal information for confined fires would result in useful information.

Why are undetermined responses and missing data in the causal factors sections of NFIRS reports so prevalent?

We heard many reasons, opinions and observations offered throughout the course of our research for why causal data in NFIRS is lacking. Most of them confirm findings of previous research. We list many of them here without judgment, in the interest of putting them on the table as factors that contribute to missing and undetermined causes in NFIRS. Some of them may have more merit or prevalence than others; some are cultural, others are resource-driven; some reflect deficiencies in training or knowledge, others reflect deficiencies in the data system or interface with the system; some are human nature, others are institutional; some may be more easily addressed than others. While we are not implying here that these influences are the case in any individual department, they were expressed by many departments in our sample, and we explore several of them in more detail in this report:

- Many departments will report "Cause Under Investigation" while the investigation is ongoing in order to avoid the possibility of conflicting reports between the NFIRS report and the investigation report, but do not subsequently update the incident report in the system after the investigation is complete. More serious fires, such as those involving deaths, are more likely to be investigated and thus are more likely to remain as "undetermined pending investigation" in the system.

- NFPA 921, Guide for Fire and Explosion Investigations, has had a chilling effect on fire officials' willingness to put down a cause if they are not 100% sure of what it is. Even if NFPA 921 does not require 100% certainty, the perception is that it does, and they fear being questioned and "hung out to dry" in court if they put down any cause at all.

- Almost all of the fire officials we interviewed conveyed that specifying a cause-related code in NFIRS gives the impression of 100% certainty and so leave a cause as undetermined if they cannot prove a cause with 100% certainty.

- A number of fire departments do not record a cause because they believe that the private investigator hired by the insurance company (who may have more resources to conduct the investigation, as well as more experience in doing so) will come along afterward and find a different cause or challenge the initial report.

- Among the participating departments, for most, if they do not have certified fire investigators, they do not feel comfortable putting down a cause in the incident report, even if they believe they know what the cause is.

- A cause might be suggested in the narrative of the incident report, but not put in the coded section - so the data does not get counted in state or national statistics.

- In smaller communities, personnel often are not trained to do fire investigations and do not have the resources to investigate most fires.

- Some departments have said that they fill out only the Basic Module, which records when and where the incident took place, but does not collect any data on causal factors. (Note: This should not be possible in NFIRS without generating an invalid incident unless the fire is confined or outside rubbish.)

- A number of fires are not investigated because the loss is not significant enough to warrant an investigation.

- If a fire is too aggressively overhauled, there may be little left to investigate in the aftermath of a fire, which can lead to an undetermined cause.

- Some personnel take shortcuts to filling out the forms, realizing that putting in "undetermined" responses will save them from having to fill in other forms within the system.

- The "2:30 in the morning problem" suggests that personnel returning to the fire station in the middle of the night after fighting a fire are going to fill out the incident report before heading to bed, and, as a consequence of their fatigue, will do the minimum amount of input to satisfy the computer.

- In some departments, the new recruit or "low person on the totem pole" gets the job of inputting incident reports. Improper or inadequate training or lack of experience can lead to inaccurate data input.

- Some fire departments train their people "on the job" as to how to input data: if those doing the training were not properly trained themselves, inaccurate information about how to fill out the forms can be perpetuated and passed on.

- A number of personnel are "self-taught" in the process of inputting data into NFIRS, and as a result have varying levels of confidence in their ability to "get it right."

- A number of personnel do not see the value or the purpose of reporting, especially if the data is not used at the department level and if they are not aware of how the data is used at the national level.

- Frustrations with the complexity of the NFIRS codes can act as a deterrent to complete and accurate reporting. For example, if an individual cannot find the code that fits the incident, an inaccurate code may be used instead.

- Problems with the software being used to input fire incident data can act as a deterrent to complete and accurate reporting.

- A number of personnel who are assigned to reporting simply do not have the time to devote to doing a complete job of filling out all of the required modules, and so they do the best they can with limited time, and move on to other things.

- Some department personnel are unaware that fire incident reports can be updated once initially input.

- Some department personnel are instructed not to update the fire incident report because it is assumed that they might be called to explain in court why the report was changed.

- In some cases, the personnel doing the initial data entry thought that someone else was following up and updating the file with additional information as it became known when, in reality, this was not being done.

Not a New Problem

Though the concern about missing and undetermined data in the causal factors sections of NFIRS reports has existed for quite a while, relatively few studies have been done to look into the causes or to address the problem. Most of those studies that have looked at the problem have done so on a local or regional basis. But as far back as 1982 a study was undertaken for the Federal Emergency Management Agency entitled, "A Pilot Study of Unknown Cause Fire Incidents in National Fire Incident Reporting System (NFIRS) Data" (Rikoski and Rossman 1982). The primary objectives of the research were "to develop and test a method for treating the number of unknown cause fire incidents in the National Fire Incident Reporting System (NFIRS) data base as well as to develop and evaluate several data collection forms" (p. E1). At the time, "Approximately 11 percent of non-residential fires and 7 percent of residential fires are listed as being of unknown cause" (p. E1). The study investigated the possibility of developing a procedure to collect and analyze data on unknown cause fires for subsequent use in improving estimates of fire causes generally (p. E2). Operating under the assumption that fire service personnel have information about the cause of undetermined fires that was not included on incident reporting forms, the 1982 study concluded that by asking respondents to provide their best estimate of the probable cause of a fire incident that would otherwise be reported as having an undetermined cause, it was possible in principle to collect additional information on fires of undetermined cause that could be used to improve estimates of fire causes, more so than by simply allocating unknown cause fires proportionally according to the distribution of known causes. The researchers recommended, among other things, improvements in routine reporting *and updating* of fire cause data at the local and state levels; and development of special procedures for collecting data on fires of undetermined cause.

Several papers submitted as Applied Research Projects in the Executive Fire Officer (EFO) Program recognized problems with fire incident data reporting and suggested ways to address them (the EFO Program is an initiative of the US Fire Administration/National Fire Academy designed to enhance the knowledge, skills and abilities of senior officers and others in key leadership roles). In an investigation of how best to use his department's software program to not only report NFIRS data but also use it to direct community risk reduction activities, Negrete (2009) made several recommendations for improved data collection using NFIRS-compliant software. These included design of a "3 a.m. friendly" template that could be filled out on-scene to facilitate complete and consistent data; revisiting the policy of requiring reports to be completed before the end of a shift to avoid concentration and proofreading problems caused by sleep deprivation; and conducting training for personnel on NFIRS, its purpose, the importance of accuracy and understanding when and why certain codes should be entered (pp. 26-27).

Stefancic (2011) looked at the causes of incorrect NFIRS data entry on the department level, and emphasized the importance of training to convey "a complete understanding of the NFIRS process and the positive outcomes of completing satisfactory reports and the negative outcomes of completing poor fire reports" (p. 34). He stressed the need to educate personnel not only on the technical aspects of completing an NFIRS report, but also "the overall theory" behind NFIRS "and the positive outcomes that can be achieved from good reporting" (p. 37). Finally, Stefancic

recommended that fire departments have a policy to "provide NFIRS generated feedback to citizens, administrators and fire department members" (p. 39).

Smith (2007) looked at the problem of accurate and complete NFIRS reports within his department, and recommended that, in addition to comprehensive training on NFIRS for department company officers, a quality control program be combined with a progressive disciplinary process involving remedial training to improve reporting (p. 34).

Steputat (2009), in developing a report on "Determining Criteria for the Development of a Fire Report Writing Guideline," noted that among the fire departments she researched about data collection practices, "those that appeared most satisfied with their collected data have assigned one individual to ensure that the data was accurate" (p. 2). This finding was consistent with her literature review on data quality improvement. Steputat also observed that her literature review uncovered a common finding that, as she paraphrased, "you can throw all the technology you want at this issue; it will be the human factor that either makes or breaks the system" (p. 20).

Quick (2011) evaluated ways to improve NFIRS training in her fire department, and found that those she surveyed wanted more hands-on training to understand the NFIRS codes, examples of correct documentation reports in NFIRS, timely feedback on errors, user-friendly software, instruction manuals, and greater understanding of the history of NFIRS and why fire departments need to collect data (p. 45). Quick also observed that a complete report is not necessarily an accurate report, and noted that a quality assurance process must check for both completeness and the quality of the data entered (p. 55).

Krueger (2010), in evaluating the consistency of his department's NFIRS data (in other words, whether similar incidents are being coded in similar ways by department personnel), made several recommendations for improving NFIRS data consistency. These included the establishment of a policy that outlines procedures to be followed by all personnel when completing incident reports; measures to directly link data between the department's computer-aided dispatch (CAD) software and the NFIRS-compliant database; training to educate personnel on correctly inputting incident data into the department's NFIRS-compliant database; evaluation of aids used to decide what information to put into incident reports; use of all available error detection routines in the NFIRS-complaint software; and a formal policy and procedure for quality review of incident reports (pp. 38-39).

Van Nest (2009) also looked at inconsistency of fire incident data in his department, specifically in the causal factors fields. His research revealed a reluctance to determine a fire cause for fear of being questioned in a legal proceeding if the respondent is not a certified fire investigator – and in some cases a reluctance to put a fire cause on the incident report even if a cause has been confirmed by a certified fire investigator, because the person filling out the report is not him/herself a certified fire investigator (p. 18). Van Nest also identified a concern among department personnel that there were not enough choices of codes within the reporting system to cover the circumstances they were seeing, and that "undetermined" or "under investigation" were the simplest choices to complete the report (pp. 18-19). The recommendations put forth by Van Nest for his department were to train and certify all front line officers as basic fire

investigators; to train all department personnel on the requirements of the reporting system; and to create more specific codes that would allow personnel to choose fire causes more accurately (pp. 27-28).

Kinsey (2012) conducted an internal review of the content coding of reported smoking fires reported by the Austin, Texas, Fire Department over a five-year period. She compared the number of smoking material structure fires based on coding alone with the narratives of structure fire incident reports that contained wording indicating a "conclusive" or "probable" determination of smoking as a cause (based on NFPA 921 Guide for Fire and Explosion Investigations definitions). Kinsey found that the percentage of smoking material structure fires increased considerably when the narratives were taken into account – indicating that often the narrative of the fire incident report contains causal information that never makes its way into the codes.

Rikoski and Rossman, in their 1982 research report referenced previously, identified early on the chronic problems that still affect the reporting of cause data in NFIRS, gleaned from a telephone survey of 36 fire departments in five states:

> How cause information is handled varies among departments. Some departments expect officers to report cause information except in cases where they really have no idea what happened; others only want officers to fill in the information when they are sure of the fire cause. Some leave it up to the individual officer to decide how to fill out the form. It is common practice in many departments for fire cause information to be reported initially as 'undetermined' or 'under investigation' if the fire is to be investigated. Under these circumstances, some departments encourage suppression officers to fill in what they can, while others prefer they leave it blank for investigators. In a few departments, it is the investigators who almost always provide the information on cause, but in some investigations this does not happen until after the form is sent to the state.

> Most departments reported that cause information is updated on the incident report once the investigation is completed and that this usually occurs before the incident reports have been forwarded to the state. When asked what happens when updates and corrections are received from investigators after the reports have been sent to the state, most departments in the survey said that they forward changes to the state.

> However, two departments reported that the original incident report is never changed. In one city, a supplemental report is filed following an investigation, but it is the original report which is sent to the state, uncorrected. (In addition, a major urban department, which dropped out of the study before the telephone survey, informed the project that its incident reports are not updated or corrected with information gained by investigators; even internally the original report is never changed.) In small departments that lack their own investigative capability and rely on state fire marshals or police to investigate, there may be additional difficulties in updating incident reports" (Rikoski and Rossman 1982, p. 19).

In a year-long national investigation that was just starting to be publicized as this report was being prepared in late 2013, Scripps Howard News Service reported that arson is much more common in reality than a review of NFIRS data would suggest. Scripps conducted a case-by-case review of arson records in the fire departments of America's 10 largest cities and found that three-fourths of the fires determined by investigators to be arson went unreported to NFIRS. Further, a Scripps investigation into NFIRS found that "56 percent of the fire departments, mostly small and medium size, did not report a single act of arson during the six-year period from 2006 to 2011" (Hargrove 2013 "Arson Conspiracy"). Scripps quoted fire service representatives who estimated that actual arson rates may amount to 40 percent or more of all fires, and compared that to a 5% "arson" rate in NFIRS.

To place these articles in context, fire data analysts remind us that the 5% NFIRS statistic refers to "intentionally set" fires, not arson fires (FEMA 2012). The FBI's Uniform Crime Reporting System is the definitive source for arson statistics, not NFIRS. Moreover, the 5% NFIRS statistic cited by the Scripps articles refers only to residential building fires and does not include outside and vehicle arson fires or suspicious fires (which would involve an Arson Module being filled out in NFIRS but never updated from "under investigation").

Despite the disparity in definition and terminology, the Scripps articles confirm that fire investigation results are too often not being updated in NFIRS reports, and that fact has tremendous implications for public safety, for insurance premiums, for the justice system, for the allocation of fire department resources – and for the credibility of the NFIRS system itself.

Many of the issues and challenges identified in these various reports have been confirmed by our research, and we will be discussing them further along with recommendations for issues that must be addressed before our nation can overcome the barriers to more complete and effective reporting of causes in NFIRS.

What We Did – Description of Process and Methodology

Personnel

Advisory Committee

An Advisory Committee was formed to provide guidance throughout the course of the grant that was made up of representatives from a wide diversity of organizations that are either involved in data collection and analysis or have a strong interest in accurate data collection. The list of Advisory Committee members is in Appendix 2.

The Advisory Committee met twice during the course of the project, in addition to regular teleconference calls, to discuss the direction, methodology and results of the findings. Their input was central to the success of this project because of the depth of knowledge and experience that they were able to bring to bear on the discussions.

Executive Team

The project was managed by an Executive Team that brought a wealth of experience to the project (brief biographies of the Executive Team are in Appendix 3):

- Karen Deppa, Director of External Relations, National Association of State Fire Marshals and the NASFM Foundation

- Shannon Frattaroli, Ph.D., MPH, Associate Professor, Johns Hopkins University Bloomberg School of Public Health

- Ed Comeau, Principal, writer-tech.com

The Advisory Committee and Executive Team thought it was important to look at the issue of data collection from a series of different perspectives. This would allow for a more complete analysis of the issues relating to incomplete data collection since we would be able to collect more information in a variety of different formats and from different sources.

Information Collection

Fire Department Policies and Guidelines Pertaining to Fire Incident Data Collection

As a part of the project, we gathered information on fire departments' policies and guidelines regarding data collection. This was done in order to get a better understanding of how fire departments were approaching the process, and 13 organizations provided material. This library of policies and guidelines is available online at http://firemarshals.org/resources/fireincidentdatacollectionresearch.html.

In-depth interviews with fire department personnel

A series of telephone interviews with 20 fire departments across the country was conducted to better understand the issues and to help define questions for the online survey. In order to get a representative cross-section of departments (urban, rural, geographic distribution, full-time, volunteer, call), the State NFIRS Program Managers on our Advisory Committee as well as

NFIRS Program Managers in other selected states helped identify departments that would meet these criteria.

Another selection criterion was departments that had either "high" data quality or "low" data quality, based on rankings provided by the U.S. Fire Administration (a definition of the NFIRS data quality rating criteria methodology is included in Appendix 4). By interviewing departments on each end of the data quality spectrum, it was believed that we would gain much better insight into the problems and issues involved with submitting complete information – though in our interviews we did not inform department personnel if they had a "high" or "low" data quality ranking.

To help in obtaining consistent information, a series of standardized questions to be asked during these interviews was developed by the Executive Team and reviewed by the Advisory Committee. These questions are included in Appendix 5.

In order to allow the participants in the in-depth interviews to speak freely, the decision was made to report the results of these interviews anonymously. The following is a more detailed profile of the 20 departments that were interviewed. We include an estimate of the number of fire incident reports entered annually to show that it is possible for fire departments, whether Volunteer, Career or Combination, to achieve a high Data Quality ranking even if they must process a large volume of reports:

Geographic Region	Type	Number of forms entered annually	Data Quality ranking
West	Combination	140	Low
West	Career	8,000 – 10,000 (80-85% EMS)	Low
South	Career	2,900	High
South	Combination	660	High
South	Volunteer	730	High
Southwest	Career	12,000 (includes EMS)	High
Southwest	Career	6,000 – 7,200	Low
Southwest	Combination	750-800	High
Southwest	Combination	2,400 (includes EMS)	Low
Northeast	Volunteer	3,200 (80% EMS and non-emergency transport)	High
Northeast	Career	1,300 – 1,500	High
South	Combination	1,200 - 1,500	Low
Northeast	Combination	420	Low
Northeast	Volunteer	250-300	Low

Geographic Region	Type	Number of forms entered annually	Data Quality ranking
Midwest	Career	10,300	High
Midwest	Combination	3,200 (only 69 were fire)	High
Midwest	Career	3,000	Low
West	Volunteer	2,000 – 2,500	High
West	Career	Estimate not obtained	High
West	Combination	7,000 (including EMS)	High

Online survey of fire departments

To expand the reach of the project even further, an online survey tool was developed by the Executive Team and Advisory Committee. This survey was distributed nationally via Survey Monkey (an online survey software and questionnaire tool, www.surveymonkey.com) through State Fire Marshals and State NFIRS Program Managers to fire departments throughout the United States. The sampling methodology used was a convenience sample, which is a way of gathering participants for a study from a naturally occurring group of people within the population being studied. We relied on State Fire Marshals to cooperate with our request to distribute the survey link to fire departments in their respective states, and from there fire department self-selected as to whether to participate. As a consequence of using this sampling method, as opposed to a more systematic approach that was not possible given available resources, we are unable to claim that our results are representative of fire departments nationally.

Even though we recognize that a number of people within a department might be involved with the fire incident data collection and reporting process, we asked that only one person per fire department respond to the survey, and controlled access electronically so that only one response was permitted per computer. Just short of 3,500 departments (3,495) responded to this survey from forty-three states, providing a wealth of information on data collection methods and attitudes. To encourage candid responses, we assured respondents that no identifying information would be used in reporting the results of the survey; results would be reported in the aggregate, and any individual responses would be reported anonymously. The survey contained 50 questions, but depending on specific responses, a respondent might not have been asked all questions. The specific questions asked in the survey are provided in Appendix 6.

Interviews with non-fire data system specialists

There are many organizations that collect data on a regular basis, and it was believed that by interviewing representatives from these organizations we would gain some insight into strategies that could be employed in NFIRS. Members of the Executive Team interviewed representatives from the following organizations:

Organization	Database
Federal Bureau of Investigation	Uniform Crime Reporting System
Bureau of Alcohol, Tobacco, Firearms and Explosives	Bomb Arson Tracking System
University of Utah School of Medicine	National EMS Information System
American Burn Association	National Burn Registry
National Association of Realtors	Multiple Listing Service Database
National Center for the Review & Prevention of Child Deaths	National Child Death Review Case Reporting System

A standard script was used to guide the interviews to help obtain consistent results that would allow for analysis. The interview questions are included in Appendix 7.

Electronic Toolkit of Resources

In order to point fire departments in the direction of free and low-cost resources to assist with both NFIRS data reporting and analysis, as well as entry-level instruction on origin and cause determinations, we have compiled an Electronic Toolkit. It is provided in two formats: an e-Book format and a tabular format. It is included as Appendix 8 and also posted online at http://firemarshals.org/resources/fireincidentdatacollectionresearch.html.

Findings

Phase I: Request for Fire Department Policies, Guidelines and Other Communications about Collecting Data

We received 38 replies from fire department representatives in four states (Texas, New Jersey, California and Iowa) in response to our initial request for information about how fire departments communicate to their members about collecting incident data. Of those, 20 departments had no policies regarding fire incident reporting at all. Of those that shared formal guidelines or standard operating procedures, only a couple of them mentioned quality control.

Our team identified one standard operating procedure document that could be used as a model for other departments, and it came from the Pennsauken, NJ, Fire Department.

Pennsauken's 4-page document stood out because of its clarity and conciseness.

- It describes why data collection is important.
- It states who has the responsibility to input data.
- It explains the basics of report writing.
- It specifies when reports must be completed.
- It emphasizes quality control and accuracy.
- It addresses the procedure for making corrections.
- It provides references for additional information.

The Pennsauken Fire Department's Standard Operating Procedure for Incident Reporting can be found in Appendix 9 of this report. Fire departments might refer to this when considering a standard procedure or guideline of their own.

And it must be said: Having a guideline in place matters only to the extent that it is communicated and followed.

South Dakota did not participate in our online survey for the very reason that State Fire Marshal Paul Merriman was just then embarking on an effort to change the way fire incident reporting is communicated to fire departments in the state. Those communications, along with relatively small changes to the state's reporting system, are expected to make a significant difference in the level of reporting by fire departments in South Dakota.

Case Study: South Dakota's Effort to Improve Fire Incident Reporting

In South Dakota, fire departments are required to report fire incident data to the state monthly, and reporting is tied to annual fire department certification, discounts on fire department insurance premiums, and access to state funding. So incentives are there for departments to report, yet the state was experiencing higher than desired amounts of non-reporting as well as incomplete reporting and reluctance to report causal factors.

South Dakota State Fire Marshal Paul Merriman explained that efforts to improve the state's fire incident reporting were prompted by feedback that the state's online reporting system was not

user friendly, which resulted in many departments not reporting at all, as well as struggles by his office to deal with incomplete reports. A survey sent out by the State Fire Marshal's Office to stakeholders confirmed that fire incident reporting was not viewed positively by the state's fire service.

Based on the survey feedback, and follow up meetings with different fire service constituencies in the state, Merriman's staff revamped the reporting format. "We made simple changes to the online program that made a big difference," said Merriman. Two programming changes in particular made a significant impact:

- **A "No Activity" checkbox was added to the reporting form.** State statute requires monthly reporting of fire incidents, and this change enabled small rural departments that may have no fire activity for months to report that lack of activity to the state on a monthly basis. It answered the question of whether these departments had no incidents vs. incidents that were not being reported, got them in the habit of reporting on a regular basis, and increased the number of users in the system.
- **The required fields in the online form were highlighted.** This change helped increase information submitted by those departments that were not providing even the minimum information on reports. (Note: This change is consistent with the USFA Data Entry Tool, which also highlights required fields.)

Like other states, Merriman observed a reluctance on the part of many departments to put down causal factors for fires. His approach has been to educate them and remind them, **"It's just the incident report, it can be changed; it is your best educated guess, it's not the investigation report."**

A "quick reference guide" for the revamped system was then published and put on line so it was accessible to all, and a hard copy was sent to each fire department in the state. In the spring of 2014, the district fire schools will be prepared to provide education about the new reporting format. The State Fire Marshal's office is also using social media and YouTube to get the message out about the importance of complete reporting.

Merriman does not expect to see an overnight change in the quality of the state's reporting, but over time and as more departments engage in reporting and are exposed to the training and messages, he is hopeful that the small changes he has made to the fire incident reporting system will result in a big impact.

Phase II: In-Depth Interviews with Fire Department Personnel

Our next step was to conduct in-depth interviews of fire department representatives who were involved in recording fire incident data for their department. The purpose of these interviews was to obtain confirmation of issues that we wanted to address in the online survey that was to come, and also to gain more qualitative insights into those issues than we would be able to get from the online surveys.

Our project team interviewed representatives from 20 fire departments in eight states (California, Idaho, Iowa, Maine, New Hampshire, South Carolina, Tennessee, and Texas) between March and June 2013. The states that participated in this portion of the research were chosen by our project team to cover main geographic US regions with State NFIRS Program Managers who were willing to work with us on setting up the interviews. For each of the eight states, we asked USFA program staff to provide a listing of fire departments' data quality scores, from high to low (the NFIRS Data Quality report provides information as to the "completeness" of incident data entered into the NFIRS system). We then asked the State NFIRS Program Managers to provide us with the names of 12 fire departments in their state: three each of career, combination, and volunteer departments, half with high data quality rankings and half with low data quality rankings as calculated by USFA.

Our project team then chose departments from the list to ensure a geographically representative mix of career, combination and volunteer departments with high and low data quality. We provided talking points about the project to the State NFIRS Program Managers and asked them to get the departments' permission to participate in an anonymous interview, and then to provide our project team with contact information. We specifically asked to speak with individuals who were involved in the fire incident reporting activity for the department, and depending on the department, that person was a chief, an officer, a fire marshal, an administrative person, or a line firefighter.

The list of questions we asked appears in Appendix 5 of this report. The questions covered the department's reporting practices, training and education about fire incident reporting, how reporting was viewed by personnel in the department, whether and what kind of feedback was received about the department's incident reporting, and how the department addressed missing and undetermined data. In order to obtain candid responses, we assured participants that their identities and departments would not be revealed in our final report. Participants also were not informed of their data quality ranking, or whether they were identified as having high or low data quality.

The results of these interviews were revealing. We found factors common to departments that had high data quality as well as among those departments that struggled with data quality. We also found common themes among departments whether their data quality was high or low.

The "Headline" Factors

Two of our findings, in our view, had the potential for having the greatest impact on whether cause data was reported in the NFIRS system:

- Data reports were not consistently (and in some cases never) modified when new information, such as fire investigation results, was obtained. We refer to this as a failure to "Close the Loop."
    - Some respondents did not realize that the fire incident data reports could be modified once initially input – when, in fact, they can be.
    - Some respondents believed that if reports were updated, they might be called into court to explain why a field was changed, and concern about this acted as a deterrent.
    - Some respondents reported that it was difficult to update a report because of the type of software they used.
    - In many cases, there was no connection between the investigators and the fire department. Thus, the people in the department responsible for data input may not even receive the investigation report or they may not realize that it is the department's responsibility to update the incident report. This was often the case when the investigator was not affiliated with the fire department, such as those assigned by the state, county or insurance company, but it was also seen when the fire investigators were within the same department.
    - A further barrier to connecting the incident report with the investigation report is that the incident report is a public document while the fire investigation report is often not a public document, in which case a wall between the two documents must be maintained.
    - Some respondents asked for tools to identify incomplete reports.

- Departments were reluctant to specify causal information in the incident report due to fear of being contradicted by more experienced investigators or challenged in court. We refer to this as the "Litigation Cloud" that seems to hang over fire department decisions about whether to report causal factors.
    - The reporting form appears to give the impression that the person inputting the data needs to be 100 percent certain of the cause
    - Some departments actively discouraged their people from specifying a cause if they are not certified fire investigators, because they "lack the credentials," even if the cause seemed "plainly obvious."
    - "Once it goes down on the form, there is no wiggle room."
    - Some respondents were concerned that if they put down a cause determination, the insurance investigators would only come in afterward and contradict them.
    - Many referred to NFPA 921 Guide for Fire and Explosion Investigations, which they perceived as requiring complete certainty about a cause.

Departments Ranked as High-Quality Data Providers: Common Factors

- The importance of complete and accurate data was emphasized as a priority from the chief level down to the line firefighters. Even those who did not enjoy reporting saw it as a legitimate part of their job.

- The departments had a formal quality control review process in place. Often, quality control is conducted by one person in the department to ensure consistency.

- A data "champion" was in place who took the lead on reporting.
  - This person was committed and motivated, and made it his or her business to understand the NFIRS codes, seek training, ask questions and help others in the department to be more accurate.
  - Learning about reporting was seen as a continuous process by these individuals.
  - Some departments had data entry personnel who were responsible for taking run sheets filled out by firefighters on-scene and inputting reports into the system, allowing for them to become more skilled in entering data than would be possible for line firefighting personnel.

- Incident reports were updated in the system when new information surfaced. This was especially the case for fire investigation reports.

- Data was used extensively within the department for such purposes as:
  - determining priorities
  - allocating resources
  - justifying expenditures and budget requests
  - identifying patterns, products and behaviors involved in fires that could be followed up with education or other remedial actions
  - applying for grants
  - comparing their activity and results to other departments of similar size.

Departments Ranked as Low-Quality Data Providers: Common Factors

- The feeling that NFIRS data forms and codes are too complex and not "user friendly," leading to confusion and frustration.
  - Several referenced the "3-inch-thick" coding manual as an illustration of how cumbersome the process of finding the right codes can be.

- o Some complained that there were too many codes to choose from, and nuances among code choices were often not understood.
  - o Others complained that the codes provided did not match the incidents they were encountering, forcing them to choose answers that were "close" to an incident but did not adequately describe the incident in their view.
  - o For smaller departments that have infrequent fires, the lack of practice in inputting incident data can lead to frustration in having to re-learn the codes each time.

- Fire personnel by and large do not understand the point of such detailed reporting.
  - o One department fills out only the Basic Module for all incidents. "I don't know if they really need all the detail" requested in other modules. (Note: While we report what this fire service representative told us, the USFA reminds us that filling out only the Basic Module would result in invalid incidents for most fires.)
  - o Undetermined codes may be used as a way to keep reporting simple, which may result in underreporting for more severe fires.
  - o Not all of the data collected at the local level gets used at the national level, which makes it difficult for personnel to justify spending time to input the level of detail requested.

- Many expressed frustrations with the software they were using to input the data. We did not ask for detailed information about the type of software that departments used, but common complaints included:
  - o Error messages that they could not figure out how to fix.
  - o Clicking on something by accident and being taken to a different screen, and not being able to get back to the first screen.
  - o Being taken to screens where the purpose for asking the information is not clear.
  - o Inability to save the report unless all required fields are filled out, which sometimes leads to inputting inaccurate data just to be able to save the report.
  - o The software resides on a computer that is generally in an office, while many questions asked by the software are about field observations.

- Fire incident data was not used by the department as a decision-making tool, and they tended not to be aware of whether their data was used by others at the local, state or national levels. Data were seen as going into a "Black Hole" once the "send" button was hit.

- Data reporting was seen by many in the department as a "necessary evil."
  - o They are not "into" report writing: "It doesn't have lights and sirens and shiny red [paint]…."
  - o There are a lot of demands on their time, and data reporting does not always rise to the top of the to-do list.

- o They do not understand the connection between the reason for NFIRS reporting and their own job responsibilities/accountabilities.

- Respondents generally reported a lack of awareness of training options for fire incident data collection, and in most cases respondents had received "on the job" training from someone else in the department – or figured it out on their own – as opposed to receiving formal training.
  - o Department personnel with differing levels of experience (from several years to new recruits) may be required to input data, which can lead to inconsistencies.
  - o On-the-job training from colleagues can lead to the perpetuation of incorrect information, miscoding and other causes of inaccurate data.
  - o In many cases, respondents thought additional training would be useful – not just about the mechanics of inputting data, but about the benefits and concepts of reporting.
  - o In other cases, respondents asserted that additional training was not needed, but fixing a system that had inherent flaws and shortcomings was necessary
  - o One respondent asked if continuing education units (CEUs) could be obtained for taking online NFIRS training.

Common Themes Among All Departments

Among all types of departments we spoke with, we found these common themes:

- The "completeness" of forms – in other words, satisfying the computer that a field was filled out – does not necessarily mean that the data accurately describe the incident.

- The lack of time that fire departments have to devote to reporting can lead to shortcuts.
  - o This can take the form of putting in information that will not result in having to fill out additional sections or modules. "There are a ton of details you can fill out on the form, but we've only got so much time. If this were all I had to do, it would be different."
  - o Some departments have forms with responses that are already completed for different types of structure fires.
  - o Some departments have "cheat sheets" for common incidents to help with coding. This can be particularly helpful for small departments that do not have many incidents and thus do not get regular practice in inputting data reports.
  - o Some departments have software that can auto-generate the narrative.

- A desire for more and better training on incident reporting was commonly expressed.

- o This included requests for "models" of what good reports look like, so departments know what they should be aiming for.
  - o Respondents sometimes complained about the lack of training/responsiveness from their NFIRS software vendors.
  - o More information is needed to know the right code to choose. "We shouldn't have to intuitively know that spilled gas belongs under hazmat."

- A simpler, more user-friendly system was also a desire commonly expressed.
  - o Capture the basic information for use at the national level. If fire departments choose to capture more detailed information, they can do so. But asking for less information will result in more departments participating, which will result in more valuable data.
  - o Share information from the state and national levels with local fire departments so they can see the benefit of their reporting.
  - o Technology is expected to make lives easier, speed up work and increase efficiency - not complicate things.

- Interviewees requested "permission" to list "most probable cause," "our best guess" or otherwise not give the impression of 100 percent certainty in assigning cause. Sometimes a cause is listed this way in the narrative, but never gets coded – so it gets lost in the statistical analysis.

- There is a lack of emphasis on report writing and data collection within the fire service, starting with the recruit classes and throughout the ranks, unlike their peers in law enforcement. Police officers are taught, from day one, to observe and document because this can make or break a case. This type of emphasis does not occur in the fire service, resulting in inconsistency in data collection.

These findings helped us to finalize the online survey, the results of which follow.

Phase III: Online Survey of Fire Departments

We present the survey findings using headings that roughly correspond to the survey instrument. Between August 26, 2013, and September 20, 2013, our convenience sampling approach yielded 3,495 responses. Note that many survey questions encouraged respondents to "check all that apply," in which case responses will not add up to 100%. Moreover, the percentages below relate to how many responded to a particular question; some responses were optional, and the questions a given respondent was asked depended in some cases on his or her responses to previous questions.

Characteristics of Responding Departments and the Respondents

Departments from forty-three states submitted responses, although for several (8) states, fewer than five departments responded. About half of the responding departments were all volunteer; more than half (58%) served populations under 10,000. The table below displays the type of department reported by our respondents against the same characteristic for all U.S. fire departments, based on the National Fire Protection Association's "US Fire Department Profile 2012" (Karter and Stein 2013).

Type of Department	NASFM Foundation Survey Responses	US Fire Department Profile 2012
Volunteer	51%	67%
Combination*	27%	25%
Career	18%	9%
Call (Paid-on-call)	4%	n/a

*For the NFPA profile, "Combination" combines the statistics for "Mostly Career" and "Mostly Volunteer."

- The individuals who completed the survey held a variety of positions within their departments, although most (61%) identified as "chief officer."

Importantly, our respondents are involved with NFIRS reporting for their departments.

- More than 60% of respondents indicated they are involved with one or more of the following activities: fill out fire incident data reports, input fire incident data reports into the computer, review fire incident data reports, and send fire incident data reports to the State Program Manager or NFIRS.
- More than half (51%) indicated they analyze their department's fire incident data.
- Almost half (46%) have been entering reports for more than 10 years.
- Furthermore, respondents report understanding why NFIRS data is collected in large numbers (93%).

NFIRS Reporting Practices

When asked about incentives or legal requirements for reporting fire incident data, almost half of respondents indicated they were aware of such enticements.

- Most often the existence of a requirement at the state (79%), department (63%), or county (27%) level was referenced here.
- Respondents also cited federal (77%) and state (67%) grant programs that require applicants to report to NFIRS.
- More than one-third of respondents (38%) indicated that using the data in departmental decision-making or resource allocation was also an incentive to participate in NFIRS.

The survey included questions about how departments report their data. Almost all (98%) use some form of electronic reporting.

- Most respondents reported their department uses third party vendor software to record fire incident data (54%), or software provided by USFA (14%) or the state (21%). A small percentage (4%) reported using an in-house software package.
- Computer Aided Dispatch (CAD) systems were more likely to be used with the third-party vendor software or in-house software (35% each) than with USFA or state software (10% and 12% respectively).
- A small percentage (2%) indicated they use paper forms only.

We asked when incident reports were put into the system relative to when the incident occurred. Our data also show variation in incident report entry time among different types and sizes of departments:

- For most (70%) departments represented in the survey, incident reporting occurs within a week of the fire, with over one-third indicating their reports are complete and entered into a computer by the end of the shift in which the incident occurs or by the next shift.
- Career departments more commonly reported entering their reports at the end of the shift or the next shift (82%) compared to combination departments (59%) and volunteer departments (7%).
- 67% to 75% of departments serving populations from 25,000 to 250,000 indicate they enter their reports by the end of next shift.
- Departments serving one million or more people complete 40% of their reports by the end of the next shift.
- 54% of departments serving between 500,000 and 999,999 report entering their reports by the end of the following shift, which is similar to departments serving between 10,000 and 24,999 (53%).
- By contrast, smaller departments (serving populations of less than 10,000) operate on a longer time frame with between 8% and 29% entering their reports during the same or following shift that the incident occurs.
- Of the 751 who responded with some other time frame, more than one-third of the answers were "monthly" (which may correspond to how often the state requires data to be submitted), and about one-quarter said "when time permits." In many of these cases,

run sheets or field notes were completed at the scene or shortly after the fire and entered into the system later.

We were interested in knowing who enters the fire incident data into the system.

- Administrative staff are more likely to enter fire incident data in volunteer departments (24%) compared to call (15%), combination (14%) or career departments (4%).
- Overall, 17% of departments reported that administrative staff enter their incident reports.
- Most commonly in volunteer departments it is the chief (45%) and officers (38%) who are entering the data.
- This is also true in call, combination and career departments, except that officers bear a larger portion of the responsibility (50% call; 60% combination; 85% career) for entering data in each of these types of departments.

We asked departments whether incident reports were reviewed for quality control.

- Pre-submission quality control of NFIRS incident reports is commonplace according to our respondents (50% indicated it always happens in their departments), although it does vary based on the type of department and size of population served.
- 66% of respondents from career departments reported quality control always happens, compared to 60% of combination, 44% of call, and 40% of volunteer.
- With regard to size of population served, 34% of departments under 2,500 reported always engaging in quality control compared to 72% of departments serving 50,000 to 99,999 people.
- The remaining departments ranged from 46% to 63% on this question.

Q13 Does anyone in the department review the fire incident reports for quality control before they are submitted?

Answered: 3,404   Skipped: 85
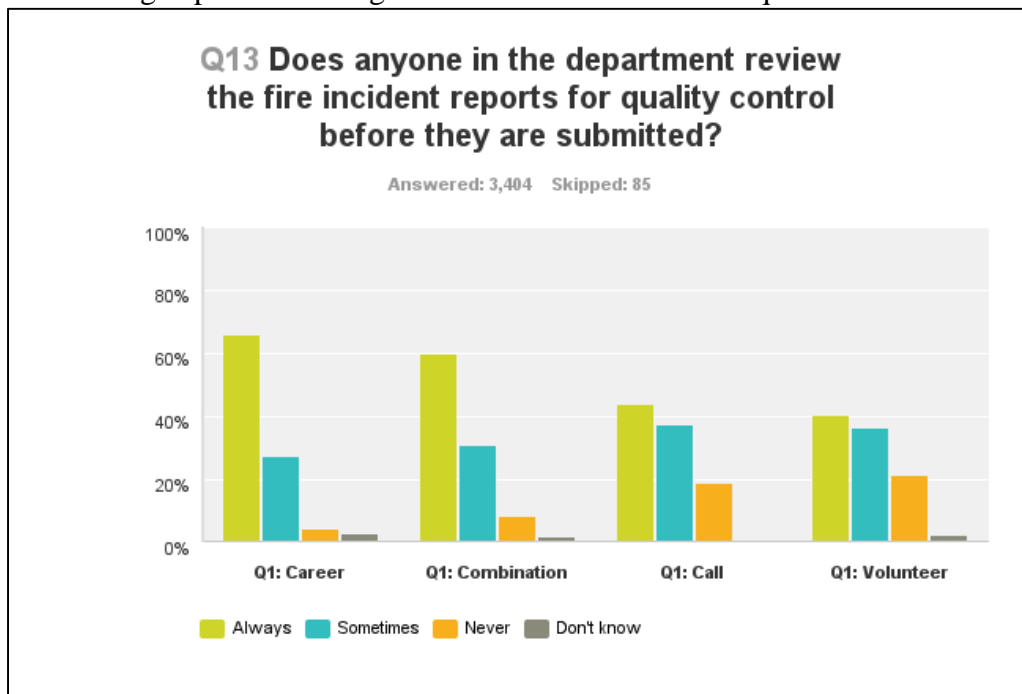
We do acknowledge that this survey question did not address what kind of quality control review was done – for example, whether it addressed completeness of the report, accuracy of the data, validity of the responses or all of the above. However, a subsequent question did address what kinds of issues would trigger an update of the NFIRS report, and that is discussed below.

Knowledge about Access to NFIRS Data

With so many departments entering incident reports within days of the incident, the ability to update those reports with investigative findings is important to increasing the completeness and accuracy of the cause and area of origin fields within NFIRS.

- 88% of respondents reported knowing that such updates are possible within NFIRS.
- While that knowledge exists, more than half (56%) of survey respondents indicated they do not receive feedback on the reports they submit.
- Of those who do receive feedback, most often it relates to incorrect coding (70%) or incomplete forms (69%).
- This feedback typically comes from the state program manager (64%), but respondents indicated that internal quality control people also provide feedback (37%), as does the fire marshal or investigator in the case (18%).

While feedback may be sparse, respondents indicated that updating entered reports with investigative findings does happen, and quite frequently. These percentages varied only slightly among different type of departments and the size of population they served.

Q19 After an investigation, a subsequent death, or the introduction of new information about a fire incident, does someone in the department update the original incident report?

Answered: 3,390   Skipped: 105
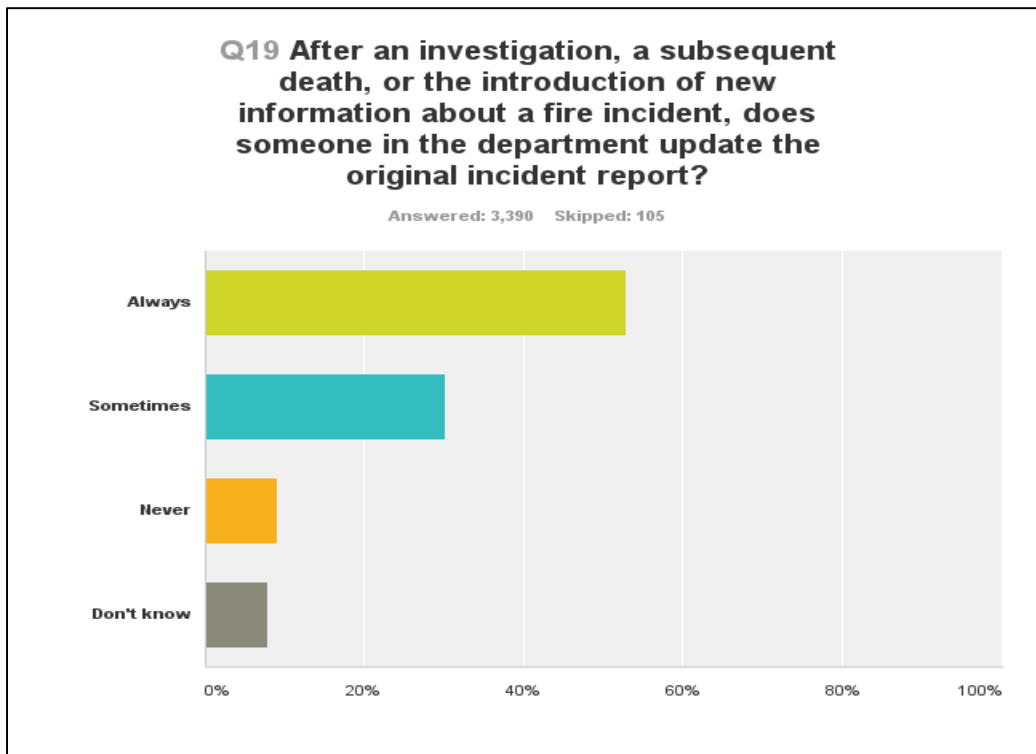
- More than half (53%) indicated their department always updates the incident reports when a death occurs or a new information about a fire is available.
- 30% responded that this sometimes occurs.
- Fewer than 10% of respondents reported that such updates never happen.
- 8% revealed that they do not know if such updates occur.

Additional comments suggested that in some cases only certain authorized personnel in the department are able to make updates, and/or only within certain time limits (for example, several respondents were under the impression that after a report is submitted to the state it cannot be updated – which is a misconception that NFIRS and State Program Managers can help to dispel).

We asked why these updates happen:

- 88% of respondents said it was due to new information about the incident.
- 65% - adding to incomplete reports.
- 62% - updating with fire investigation reports.
- 53% - correcting miscodes.
- 49% - updating when a fatality occurs.
- 23% - reconciling inconsistent responses.

By contrast, for those respondents who indicated their departments do not update entered reports:

- 37% responded that they do not receive the investigative reports that would allow them to make those changes.
- 14% cited investigators' lack of access to the system.
- 9% cited lack of a responsible person.
- 7% cited lack of knowledge that such updates were possible.
- Fewer than 2% of respondents said that they were discouraged from updating the initial incident report, a finding that differed from some of the anecdotal information we had obtained as part of this project.

Among the comments we received in response to this question were:

- "Lack of communication and priority."
- "Not aware they needed to be updated."
- "Investigations are criminal reports and security in our third party software [will not] allow investigation reports to be included."
- "We have no process to [update]."
- "Too much time has passed since we originally input the data and are no longer able to update through NFIRS."
- "Some items are high in importance, others are not worth two hours to update."
- "Poor quality control."
- "The system is too cumbersome."
- "We just forget."

- "Once the report is submitted to the state, it cannot be altered in any way even if there is information that is gathered about the incident that is pertinent to the case or call."
- "We do not currently have a firefighter trained to do NFIRS reports. We had someone signed up for a state training class – and the state canceled the class."

Training for Incident Report Entry

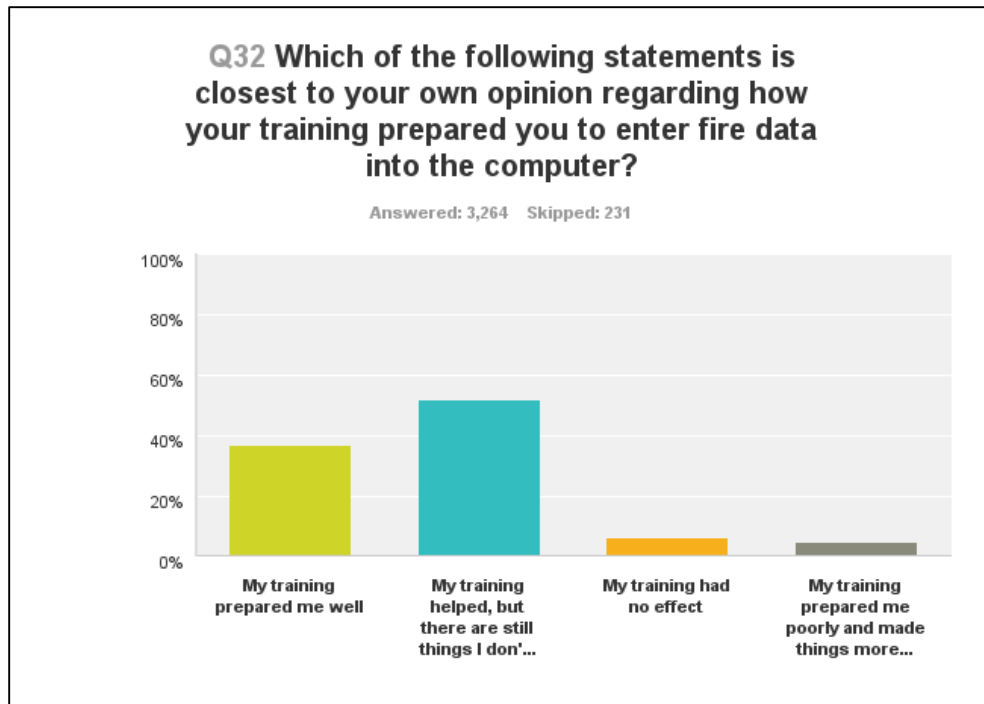When asked to describe how people in their department are trained to enter NFIRS data:

- Respondents most frequently cited "on-the-job training" (63%), followed by self-taught (46%).
- Our data indicate that more formal training strategies are also used, most commonly (27%) is training by the department, software vendor (22%), or the state (21%). We note that the combination of these three sources of formal training exceeds the "on the job training" responses.
- Training provided by the USFA or the National Fire Academy (NFA) was cited infrequently: 3% indicated on-line training is used, 2% referenced on-campus training, and 1% named off-campus National Fire Academy training when describing how people learn NFIRS (though several who took the NFA training commented that they found it to be very helpful).
- Many who chose "other" for this response cited the helpfulness of the NFIRS State Program Manager in answering questions or providing assistance.

In describing the content of the training they received:

- 92% of respondents indicated it taught them how to use the software.
- 69% said their training taught them how to select the proper code.
- 45% responded that their training covered why data is collected and reported.

In reflecting on their overall training benefit:

- Most (52%) conveyed that their "training helped, but there are still things I don't understand."
- More than a third (37%) responded "my training prepared me well."
- Much smaller numbers concluded "my training had no effect" (6%) or "my training prepared me poorly and made things more confusing" (5%).
- Of the 295 comments received in answer to this question, many emphasized that they had received no training other than what they have been able to teach themselves.

Q32 Which of the following statements is closest to your own opinion regarding how your training prepared you to enter fire data into the computer?

Answered: 3,264 Skipped: 231

The training experiences varied by type of department.

- Call (54%) and volunteer department (57%) respondents were more likely to report being self-taught than combination (34%) and career (29%) affiliated respondents.
- Respondents from combination and career departments reported relying heavily on "on-the-job training" (86% career; 76% combination).
- The career and combination departments in our sample appear to make much greater use of formal department training programs (54% and 38%, respectively) than do call and volunteer departments (19% and 13%, respectively).
- Call and volunteer departments seem to rely more heavily on state provided training (26% volunteer; 26% call; 16% combination; 12% career).
- While the numbers are small, career and combination more frequently cited on- and off-campus training provided by the federal government compared to call and volunteer affiliated respondents.
- These differences in training experiences translate into different levels of satisfaction with the content. Volunteer and call respondents reported lower levels of satisfaction with how their training prepared them compared to combination and career respondents.

Despite the variation, and the clear levels of dissatisfaction with training among some respondents, when asked if additional training would be helpful to improve the quality of data reported by the fire department, 84% responded that it would.

Q35 Would additional training on fire incident reporting be helpful to your department for improving the quality of fire incident data collected?

Answered: 3,244   Skipped: 251
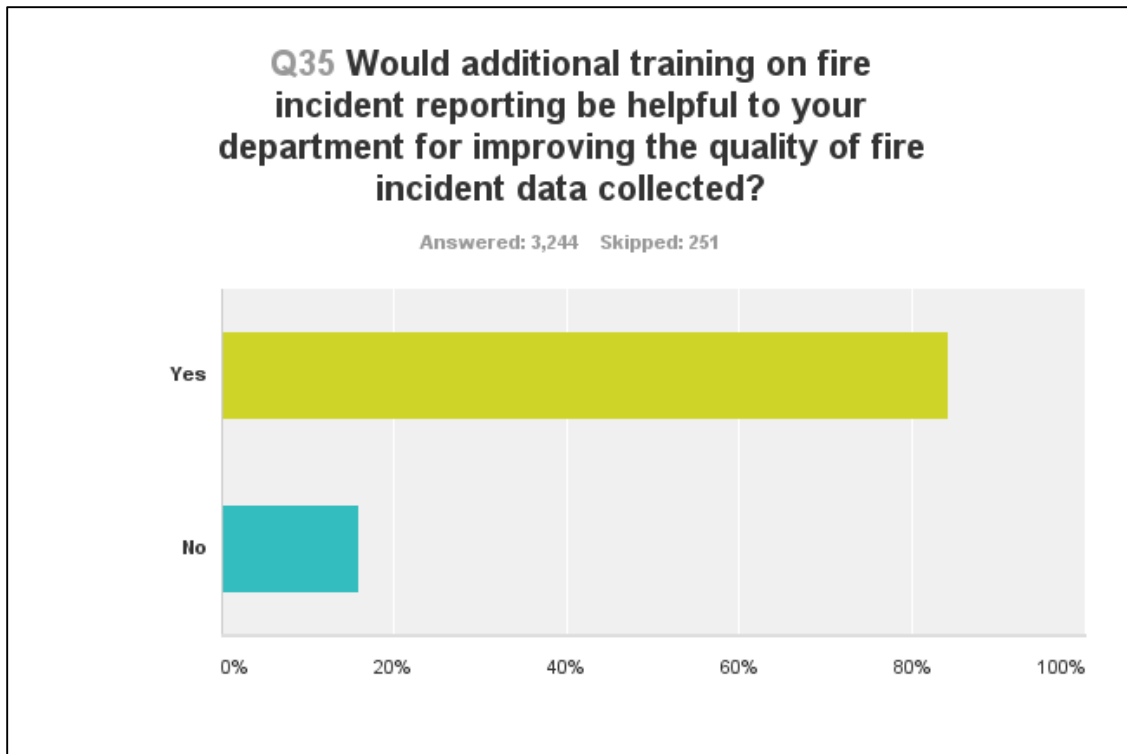
- There was not a clear preference for the venue for this training: 69% favored a classroom setting, 53% selected on-line, and 49% indicated one-on-one training would be most helpful.
- Awareness of available training and support programs was low: fewer than half of respondents indicated they are aware of private software vendor training (49%), state fire agency training (47%), and USFA/National Fire Academy training (34%), while 22% of respondents are not aware of any training.
- Most (55%) have never received any refresher training and an additional 14% indicated they were never trained in the first place, so "refresher" training wouldn't be appropriate for them.
- Comments to the question about whether additional training would be helpful to improve the quality of fire incident data reporting also included the caveat that the NFIRS system itself also should be improved, particularly in the area of making the codes more representative of the fire situations being encountered by today's fire departments.

Use of Fire Incident Data

One finding from our in-depth interviews was a concern that the data collected by the departments is never used at the department or local level. This observation was supported by most of our online survey respondents:

Q40 Does your department use fire incident data for staffing, resource allocation, or other purposes?

Answered: 3,234   Skipped: 261

Don't know

Yes

No
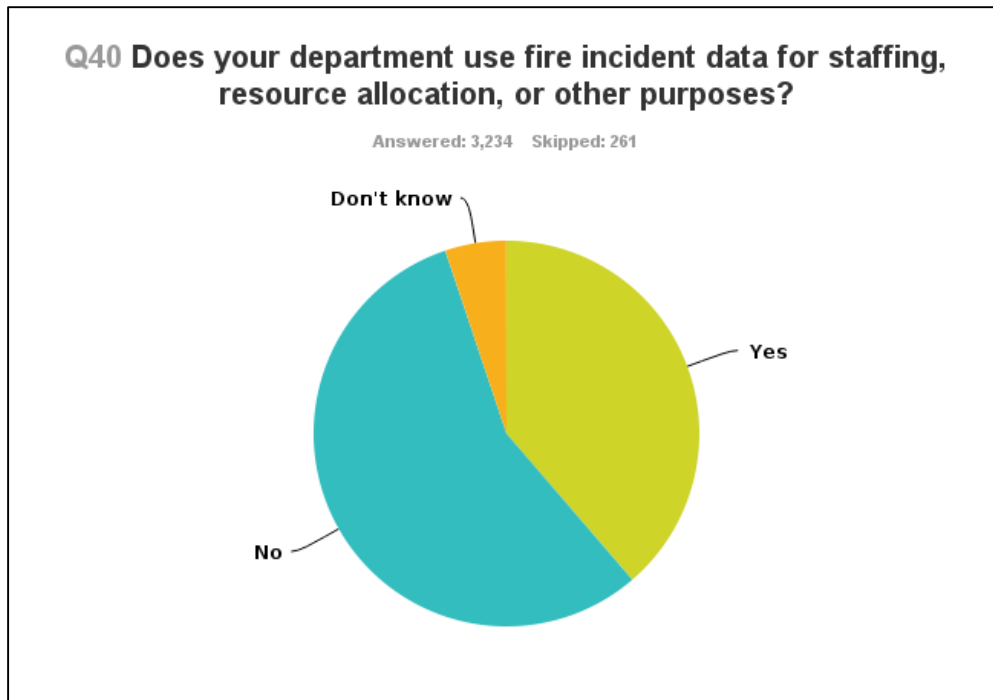
- More than half (56%) indicated that their department does not use incident data for planning or other purposes.
- A similar number (51%) responded they did not know of other groups who use the data.
- Of those who are aware of the data being used by other organizations, state fire protection agencies were most commonly cited (67%), followed by city/county agencies (50%), the federal government (47%), insurance companies (43%), and national organizations (28%).

Reflections on the Data Collection Process

We asked respondents to reflect on their thoughts about fire incident data collection as it relates to their own department and experiences.

- Despite the challenges shared by respondents, most believe their department does very well (30%) or fairly well (58%) at reporting fire incidents.
- Furthermore, most (63%) described the time spent on reporting as "a good use of my time" as opposed to "a necessary evil; I would rather be doing other things" (34%).
- Only 3% responded, "I don't see the value in the time I spend on it."
- Many of those who commented to this question said simply, to paraphrase, "It's part of my job, it has to be done, so I do it."

However, when asked to describe how most of their colleagues feel about the time they spend on incident reporting, a different picture emerged.

- Respondents were more likely to choose the "necessary evil" option (59%) over "good use of my time" (23%).

- They were also much more likely to opt for the "they don't see the value" (18%) choice when describing their colleagues' attitudes.
- A number of the comments to this question noted that their colleagues in the department for the most part are not even aware that reporting is done.

(Q45-46)
How They Feel About Fire Incident Reporting
Percentage of 3,214 responses
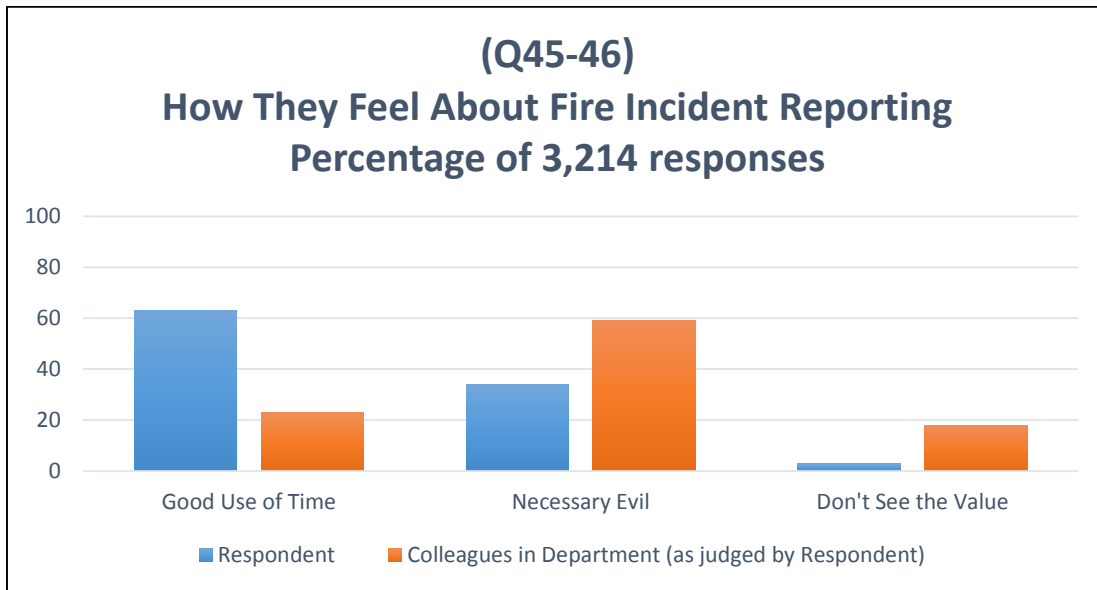
When asked to choose an explanation for why people in their departments may be discouraged from entering specific fire causes:

- 52% of respondents chose "If we can't be 100% sure of causal factors, we put down undetermined."
- More than a third of respondents (37%) selected the explanation, "the personnel entering the data are not qualified fire investigators."
- One-quarter of respondents chose the explanation, "the incident did not warrant an investigation, so the cause was left undetermined."
- 31% percent indicated "this does not happen in my department."

When asked how their departments could reduce the number of undetermined or missing/blank responses in causal factors fields, respondents favored several approaches.

- 53% selected the option of changing the reporting to reflect different confidence levels.
- 48% thought additional training would be helpful.
- 34% suggested improving the software so it is more user-friendly.
- 30% favored increased awareness about the importance of data collection.
- 22% chose the option to update the causal factors field after the investigation is complete.
- 22% also thought that reducing the number of codes would be helpful.
- Only 2% of respondents chose the option to "allow personnel to sleep rather than immediately complete the report in the middle of the night." This response suggests that

the "2:30 in the morning" problem may not be nearly as much of an issue as it is widely perceived to be, at least as far as completing fire incident data reports are concerned.

Phase IV: Interviews with Non-Fire Data System Specialists

We wanted to look at non-fire data systems to see if there was anything we could learn from them. These systems are also collecting large amounts of data on a regular basis from many sources across the nation, and we were looking for any lessons learned that we might glean from their experience that could be applied to NFIRS.

This phase of our research was prompted by the fact that law enforcement is often cited as a model for how to do incident reporting, in contrast to how reporting often works in the fire service. To illustrate, Robert J. Davidson of Davidson Code Concepts, LLC, describes his experience as a Law Enforcement Officer (LEO):

> I've worked the LEO side in addition to the fire service. Report writing was a basic skill taught in the police academy, and then they taught you traffic accident reporting on top of that. They were both emphasized as a core responsibility and accuracy was hammered into each trainee. On the job you handed your paperwork in at the end of each shift and it was checked by the shift commander; if anything was not right it was kicked back to you to be completed properly, [and] the traffic reports got a second review by the traffic bureau. ALL of their incidents (and software used) had to be coded and entered for the National Uniform Crime Reporting System (UCR). If the data you transmitted up to the State level had problems, your agency got a visit to find out what the problem was. And you did not see any grant funding requests acted on unless you were up to date on your UCR reporting. Period. (Davidson 2013)

While in some cases we ended up comparing apples to oranges, there was often a practice or an approach that we believe might be worth consideration by NFIRS, and we indicate those factors in boldface in the summaries that follow. They include the following ideas:

- Provide incentives for departments that achieve high Data Quality rankings.
- Cut down on the number of required data elements transmitted to the national database while allowing states and localities to collect additional data for their own purposes if they choose.
- Maintain two committees to provide input into NFIRS improvements and challenges: One consisting of those who input fire incident data at the local level, and another comprising those who analyze and report on the collective national data, with NFIC representatives and NFIRS staff acting as liaisons between the two committees.
- Allow for a "probable" determination of cause when certainty is not possible.
- Enable fire departments that input data into NFIRS to access certain data from other departments.
- Enable the public to access some of the NFIRS data online via defined reports.

Uniform Crime Reporting Database

Note: The following information was obtained in an interview with a representative of the FBI UCR program and from the UCR web site.

Crime statistics in the United States are maintained by the Federal Bureau of Investigation (FBI) Uniform Crime Reporting (UCR) system (www.fbi.gov/about-us/cjis/ucr). This is a voluntary data collection process involving 18,000 police departments from across the nation that has been in place since 1930. Participating agencies include city, university and college, county, state, tribal and federal law enforcement agencies and these agencies represent over 308 million people in the U.S., or 98% of the population.

There are two ways in which data can be entered into the UCR Database – in a summary format of crimes that have occurred within a jurisdiction, or in an incident-based report. The summary-based system covers eight reportable crimes that include:

- Murder and non-negligent manslaughter
- Forcible rape
- Robbery
- Aggravated assault
- Burglary
- Larceny-theft
- Motor vehicle theft
- Arson

Following a comprehensive review and overhaul of the UCR system in the 1980s, the National Incident-Based Reporting System (NBIRS) under the UCR was launched. The incident-based system, which is currently used by approximately 1/3 of the agencies, is the system towards which the FBI would like to move everyone in the future because it allows for a more comprehensive database and more detailed analysis of the statistics.

NBIRS captures 57 data elements in the following segments:
- Administrative
- Offense
- Victim
- Property
- Offender
- Arrestee
- Bias-motivated offenses
- Gang activity
- Law Enforcement officers killed and assaulted
- Cargo theft

There are a series of publications that the FBI publishes on a regular basis based on the information in UCR that are all available for download from the UCR web site. These include:

- Uniform Crime Report (annual)
- Hate Crime Statistics (annual)
- Law Enforcement Officers Killed and Assaulted (annual)
- Crime in Schools and Colleges: A Study of Offenders and Arrestees Reported via National Incident-Based Reporting System Data
- The measurement of White-Collar Crime Using Uniform Crime Reporting (UCR) Data
- The Structure of Family Violence: An Analysis of Selected Incidents
- Victims and Offenders: A New UCR Supplement to Present Incident-Based Data from Participating Agencies
- Bank Crime Reports (4x a year)
- Campus Attacks: Targeted Violence Affecting Institutions of Higher Education Financial Crimes Report (annual)
- Internet Crime Reports (annual)
- Mass Marketing Fraud Threat Assessment
- Mortgage Fraud Reports (annual)
- National Drug Threat Assessment 2011
- National Gang Threat Assessments (several)
- Terrorism (several)

In addition to the published reports, it is possible for the public to access the UCR data through an online UCR Data Tool (www.ucrdatatool.gov/). The user can build tables within the following parameters:
- National crime estimates from 1960 through the most recent year available
- State crime estimates from 1960 through the most recent year available
- City and county crime counts from 1985 through the most recent year available

How the data is collected: As pointed out above, participation in the UCR system is voluntary, but very successful. Similar to NFIRS, 46 states have a central repository with a manager who oversees the data quality before it is sent onward to the FBI (the other four states submit their data directly to the FBI). Whether the information is submitted in a summary form, using the eight offenses listed above, or in an incident-based format, is up to the local jurisdiction to decide.

The local agency must meet certain criteria before obtaining certification and being permitted to submit their information into the UCR, either in summary or incident-based format.

Training: There is a staff of three people at FBI headquarters that provide training to the local jurisdictions. In addition, the state UCR program manager may also provide training to the local agencies. Currently, there is no web-based training available, which is an option that is being considered for the future.

Quality Control and Updating: Quality control occurs at both the state and federal levels. Incidents, once they are entered, can be updated as new information becomes available. Since there is no personal identifying information in the data, it is all in the public domain and can be queried by the public. (The exception to this is that when an officer is killed in the line of duty, there is personal identifying information entered, but that information is redacted for public inquiries.) At the local level, it is up to the individual agencies to determine who is qualified to make the data entries.

National Association of Realtors

NOTE: The following information was gathered in an interview with a representative of the National Association of Realtors and from the NAR web site www.realtor.org/topics/nar-doj-settlement/multiple-listing-service-mls-what-is-it.

While real estate data might seem like an unusual comparison to consider in relation to NFIRS, we were struck by the fact that the real estate community is collecting a wealth of data and reporting on it in an almost real-time environment. The Multiple Listing Service (MLS) database run by the National Association of Realtors (NAR) collects information on existing home sales, closed sales that have occurred, financing, how long it was on the market, and pending home sales where the contract has been signed. The data is used to facilitate the transactions and the national association collects it as a byproduct.

When a house is put on the market, the local agent will enter the information into the MLS. Whenever there is a change in status on the property (price change, under contract, sold, taken off the market) this update is also put into the MLS by the local real estate agent. **The person making the original entry and updating it has a strong incentive to keep it current because his or her commission is based on the information in the listing.**

The local database is managed by each of the 800 local realtor associations who then submit aggregate summaries into the national database. It is voluntary, but they have a very high participation rate.

There are two mechanisms by which the national association gets the data. One is by the local association submitting a summary to the national office, and in the other case the national office has access to the local's database and can pull it directly, which allows for more accuracy and consistency in data.

Local real estate agents generally do not use the aggregated information, but the local realtor association may use information from their region to monitor trends in home sales. The national association puts together national monthly reports that they share with the local associations and that are also used on a national level to monitor trends or help in crafting legislation. When compiling this information, the national association uses 200 representative local associations from across the nation in its monthly reports on home sales.

The national office does not do any training on data entry.

In terms of data quality, the biggest problem is that of definitions. Since all real estate is local, there may be a variety of different definitions for the properties (single family, condo, row house, town house, etc.). Since the information entered into the database by the local agent is connected to the sale and subsequent compensation that the agent receives, it is believed that there is a fairly high level of accuracy in the information entered, with some exceptions related to definitions as indicated above.

The National EMS Information System (NEMSIS)

NOTE: The following information was gathered in an interview with a representative of the University of Utah School of Medicine and from the website www.nemsis.org.

NEMSIS is a national repository for standardized emergency medical services (EMS) data. It was developed as a result of the realization coming out of the September 2001 terrorist attacks that data collection in emergency situations was not standardized, and so there was no way to aggregate data from different states and regions to answer even the simplest of questions. NEMSIS aims to develop common data elements, definitions and values to better enable emergency care to be characterized on a national basis.

NEMSIS is funded by the National Highway Transportation Safety Administration (NHTSA). NHTSA's National Center for Statistics and Analysis (NCSA) houses NEMSIS data at the national level. The EMS program at NHTSA contracts with the University of Utah, with the assistance of the University of North Carolina, to serve as the NEMSIS Technical Assistance Center.

NEMSIS developers built a data dictionary based on consensus, using XML as the standard program format for the core software. This standard enabled data to be passed easily between different software formats. **The core software was given away to vendors, to ensure that all started from the same basis. Having the core software to build upon saved the vendors money in development costs.** Vendors are tested by NEMSIS for compliance, and compliant vendors are listed on the NEMSIS website. States then contract with a NEMSIS-compliant vendor to develop software to their specifications. For the current version of the NEMSIS software (Version 2), 93 vendors are NEMSIS-compliant. Vendors were willing to accept the NEMSIS standard after the NEMSIS staff obtained Memoranda of Understanding from states and EMS agencies at the local level that stated they would move to the NEMSIS standard.

NEMSIS data is uploaded to the national database from states only, not from individual EMS agencies within states. Each participating state requests that all EMS agencies within that state collect the same core set of elements. Many state cannot dictate what software is used by local agencies, though some require local agencies to use NEMSIS-compliant software in order to receive state funding. Other states make the software available for free to all EMS agencies within the state or provide computers as an incentive to use NEMSIS-compliant software.

The initial version of the core software contained more than 450 data elements that an agency could choose to collect at the state level, but **only 72 data elements are transmitted to the national database**. Version 2 of the software is currently being used and was designed to represent a comprehensive patient care record similar to a paper form traditionally filled out by EMS agencies. To make it easier on the users and the vendors, Version 2 was "locked down" and not changed. It was opened up only once, after 4 years, to make critical changes so that the system would work correctly, and then locked down again.

Work has already begun on Version 3, which contains more than 700 data elements and many improvements. Version 3 contains a minor 1-year revision cycle that is released every March. All vendors will have to incorporate the revisions within 9 months, so that all agencies are using the most recent version of the software by the first of every year.

Data is input at the local level, usually by the ambulance driver and the care provider who go out on the call. Some of the data is input as the incident is going on, and the rest is completed after the patient is at the hospital. Many states require an individual patient care record to be closed within 12-24 hours after a call. States are asked to upload the data to the national database quarterly.

NEMSIS first started collecting data at the national level in 2006. At that time, 3 states were participating and 300,000 records were reported. Currently, 19.8 million records are collected annually from 42 states and territories of the U.S., out of a possible 26 million records. California and Texas are two of the states that do not yet participate in NEMSIS.

Training on data collection is left up to individual states. Many states require software vendors to develop a field product that can be used at the local level in addition to a state-level product, and also require the vendors to provide training on their system at both the state and local levels.

A complete suite of online tools on the NEMSIS website allow users to view their own data, including quality control issues.

Missing, incomplete or invalid data (for example, reporting a pregnant male patient) are common problems encountered at the national level. The experts who staff the NEMSIS Technical Assistance Center will report errors and data quality ratings back to states and local agencies, but do not require data reports to be resubmitted with corrections, because they lack the resources to handle resubmissions. However, the **data quality reports that are sent from the Technical Assistance Center to the states and local agencies in the form of a report card have resulted in improved quality in subsequent data that is submitted. Local agencies are motivated to get a better grade next time, or to maintain a high data quality grade.**

The NEMSIS technical staff also discovered that the majority of problems with the data were not user errors, but errors associated with the standard or the software. So the motivation for beginning development on Version 3 of the software was to fix elements that were bad or that could be improved. Version 3 mandates additional standardized business rules that will enable more incomplete and inconsistent data to be flagged, as well as containing improvements to the data dictionary and reducing default settings and auto fill-ins that may not be accurate. Version 3 also allows almost real-time reporting of data.

The NEMSIS representative shared several key points that he felt have been important to the success of the NEMSIS database, and many were learned over time:

- Providing all vendors with the standardized plug-in "heart" of the programming system in XML format.
- A user education component that involves correct use of the software and the importance of not taking shortcuts when there is data that can be reported.
- Online tools to enable state and local agencies to view and access their own data.

The National Burn Repository of the American Burn Association

NOTE: The following information was gathered in an interview with a representative of the American Burn Association, and from the website http://www.ameriburn.org/NBR.php.

The American Burn Association National Burn Repository (NBR) summarizes burn data over a 10-year period of burn cases in the United States and several foreign countries. The central repository summarizes the data relating to quality, demographic and injury information, and outcomes to prepare reports using a standard data set. The system collects clinical characteristics and certain outcomes of burn treatment about incidents handled by specialized burn care facilities in the United States, Canada and Sweden. The data represents a large convenience sample; it is not intended to be representative of all cases in all burn centers.

Each year, the ABA issues a call for data, to which burn centers respond voluntarily. A different mix of burn centers participates in data submission each year; most are the same as previous years, and some are new each year. For the most recent reporting year (2013, representing data from 2003-2012), 87 burn centers submitted data to the NBR, representing 21,657 new records. Data is collected for the year beginning July 1, and burn centers submit data annually, once per year. The ABA issues summary reports annually that look at only the previous 10 years of data that have been collected by the NBR.

The incentive for burn centers to participate is the ability to use their data internally to support quality of care, as well as in advocacy with legislators when making the case for increased resources for burn care.

The burn centers decide who inputs the data at each site, so the experience of those inputting the data can vary. ABA works with a vendor to create the TRACS Burn Registry software program that most burn centers use for inputting data. Training on the data system is provided yearly at the ABA Annual Meeting and via online web sessions.

The NBR administrators are candid about the limitations of the data collected by the system, and those issues are pointed out in their annual reports. At the same time, they have worked diligently, and successfully, to improve the accuracy of the system. As stated in the introduction to the *National Burn Repository 2013 Report, Version 9.0* (American Burn Association, National Burn Repository® 2013), "This year's submission represents the most concise and complete data collection in our history. From 2003 to 2007, 16 – 19% of elements from the minimum data set were missing. Since 2009, less than 10% elements in the minimum data set were missing. This year's call for data had a record breaking 2% of the elements in the minimum data set missing. The data being submitted by the contributing registrars is the cleanest in the NBR's history."

Improvements in the data quality have been influenced by software upgrades that have helped to standardize the data submitted to the NBR, including a Minimum Data Standard that requires a list of data elements to have known values. Data that is submitted to the NBR is forwarded to the software developer for review. If a report is found to be incomplete, it is returned to the burn center for corrections. This proactive process helps to ensure that the data reports are corrected up-front before a report and analyses are developed. ABA is also working on a validator tool to increase the accuracy of reporting, expected completion in 2014.

To address issues with incomplete or missing data and to determine what improvements should be made, two key ABA Committees exist, one at either end of the process. The ABA Burn Registry Committee includes registrars (those who input the data), as well as some doctors and nurses, who focus on the actual data input process. A second committee, the ABA National Burn Repository Committee, focuses on the analysis and reporting of the data. For the sake of communication and continuity, some members serve on both committees, and ABA staff interact with both committees. Increased communication and focus on improving the system from both an input and an output perspective has been a key factor in improving data quality.

The Bomb Arson Tracking System of the Bureau of Alcohol, Tobacco, Firearms and Explosives

NOTE: The following information was gathered in an interview with a representative of the Bomb Arson Tracking System of the Bureau of Alcohol, Tobacco, Firearms and Explosives, and from the website http://www.atf.gov/applications/bats/index.html.

The Bomb Arson Tracking System (BATS) is a secure web-based case management system for law enforcement agencies that is designed to collect all fire and explosive incidents reported in the United States and maintain it in the US Bomb Data Center (USBDC) national database. BATS was authorized as a result of the Homeland Security Act of 2002, in response to the September 2001 terrorist attacks. The BATS/USBDC database is a consolidation of the Arson and Explosives Incident System of the Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF), and the Automated Incident Reporting System of the Federal Bureau of Investigation, and so includes data previously collected by those systems.

Currently, BATS participants include 97% of all bomb squads in the nation, and more than 20 State Fire Marshals' offices. Altogether, there are 9,500 users representing 1,700 agencies nationwide. The system currently has over 300,000 incidents dating back to the 1970s.

The system is web-based, and available at no cost to all users who have an account and Internet access. Because of the nature of the data collected, and its potential role in criminal cases, access is restricted only to those who are verified by their agencies to use the system.

Data input takes place at the user level, preferably by the person who saw the incident and was involved in it, rather than by a third party. Reporting is required by federal agencies and for all incidents investigated by ATF; it is voluntary for the fire service. About 7,000 users voluntarily submit data into the system.

Training on BATS is provided at the Bomb Technician School at the Federal Bureau of Investigation, as well as at the National Fire Academy's Fire/Arson Origin and Cause Investigations Course in Emmitsburg, Maryland. Local training requests are also supported.

The initial reporting into the BATS system comprises 13 fields, which comprise the information that BATS wants to collect nationally: time, date, location, and nature of the event. But users have the ability to enter hundreds of pieces of information, depending on the complexity of the event and their desire to use the system as a case management tool.

Incentives for users to report into the system include the fact that users at the local level are able to access not only their own information, but also the information input by other agencies. The sharing of data nationally among agencies with the proper level of access enables users to search and analyze data to discover trends, patterns and leads. In addition to case management ability, BATS also enables users to produce customized reports using standardized terminology. BATS also delivers advisories from ATF and provides access to an Investigative Resources Library. New features are always being added to the system based on user feedback.

BATS relies primarily on local quality control efforts to ensure that data is complete and accurate, but the system is also set up to send out reminders if certain data fields are missing.

BATS and NFIRS are separate systems with different goals, and are not intended to replace each other: NFIRS documents the fire incident, while BATS documents any post-incident investigation in cases involving fire or explosives. But some departments that participate in both systems have expressed frustration at what they see as a duplication of effort to input some of the same incident information into both systems. In fact, BATS was designed to use some of the same incident codes as NFIRS to better enable coordination between the two systems. However, funding does not exist to develop an interface between the two systems.

The BATS representative interviewed believes that both the NFIRS and the BATS systems would be strengthened and would best serve the fire community if the funding were provided to officially link the NFIRS and BATS systems, so that authorized users could efficiently access both systems from a single interface, and enter incident data that is needed by both systems just one time.

Child Death Review Case Reporting System

Note: The following information was obtained in an interview with a representative of the National Center for the Review & Prevention of Child Deaths and from the website www.childdeathreview.org.

The Child Death Review Case Reporting System is a national, web-based case reporting system that was piloted in 2005 with funds from the national Health Resources and Services Administration (HRSA). It is administered by the National Center for the Review & Prevention of Child Deaths, a program of the Michigan Public Health Institute. The pilot initially included 14 states. Since then they have expanded to include 43 states. In October of 2013 they released version 3.0 of their system, and offer a paper version that mirrors the electronic module. The system collects data on the child, family, supervisor and perpetrator; investigative actions; services needed, provided or referred; risk factors by cause of death; recommendations and actions taken to prevent deaths; and factors affecting the quality of the case review.

Child death review (CDR) teams exist to shine a light on child deaths for the purpose of identifying interventions points that may have prevented those deaths, and implementing systemic responses that are informed by death review data. Such systemic responses aim to prevent future child deaths from occurring.

There are many similarities between NFIRS and the CDR processes. As detailed on the website www.childdeathreview.org, the National Center identifies the following 10 objectives for CDR.

1. Ensure the accurate identification and uniform, consistent reporting of the cause and manner of every child death.

2. Improve communication and linkages among local and state agencies and enhance coordination of efforts.

3. Improve agency responses in the investigation of child deaths.

4. Improve agency response to protect siblings and other children in the homes of deceased children.

5. Improve criminal investigations and the prosecution of child homicides.

6. Improve delivery of services to children, families, providers and community members.

7. Identify specific barriers and system issues involved in the deaths of children.

8. Identify significant risk factors and trends in child deaths.

9. Identify and advocate for needed changes in legislation, policy and practices and expanded efforts in child health and safety to prevent child deaths.

10. Increase public awareness and advocacy for the issues that affect the health and safety of children.

Their experience thus far with the national system is that, similar to the fire service, their users are diverse, and there are child death review teams in all states. The National Center recognizes that their users and audience are diverse and they need to be flexible to accommodate that diversity. At the time of the interview, more than 1800 users participated in the system.

In developing the web-based system, they aimed for it to be user-friendly and for their training to be accessible. Of note, the fact that their process is relatively easy to master is a real source of pride. They are committed to the idea that their process will not require a lot of intensive training in order for users to participate well. Their data collection form is more than 20 pages long -- by definition they are always dealing with a death, making their cases complicated – but many of those pages address cause of death and only one option per case is detailed through the report and three pages are reserved for notes. There are no codes on their form – the variable options are all text. Their system does use a data dictionary, but it offers guidance on how to complete a particular aspect of the form, and with version 3.0 the guidance is imbedded in the data entry template so it is accessible to those entering the data.

Their system allows for users to access local files through a secure login procedure and includes 32 standard reports they can use to facilitate analysis and dissemination of the collected data. In addition, most states do produce an annual report (about half are required to do so) which further aids in disseminating the data collected. The new version also provides users with the ability to add custom questions for their states. This has been very important in terms of engaging states and being responsive to their specific interests and needs. Our interviewee emphasized that the revision incorporated a lot of the users' suggestions, and she believes that has been important in showing the front-line people that they are being heard and that they have a voice in this process. In addition, some states work with epidemiologists to help with analyzing and interpreting the data to further inform prevention interventions. The National Center receives all of the state reports and de-identified data.

We learned that data consistency is an issue with CDR. People entering the data are volunteers, but generally these volunteers are the same one or two people on each team. Thus, there is some consistency within teams in how the data are entered, and those who perform data entry have the opportunity to do that job regularly and build their expertise. Because the team members are volunteers, the states play an important role in encouraging team members to assure their data is high quality. The National Center has worked very hard to develop and maintain good working relationships with the state coordinators, and that has been important to their success so far. The state-level coordinators (the fire service equivalent would be the State NFIRS Program Managers) provide the eyes and ears for what is happening on the front lines and are critical to assuring the system is working well.

The CDR process does face a similar challenge to fire incident reporting with regard to identifying the cause of the event that is the subject of the report. **The CDR form includes a "probable" option that was recently added to allow for a "softer" judgment with regard to responsibility for the deaths under review.** In addition, the CDR process uses team review and deliberation, which may help to shield individuals from some liability or aggressive tactics when litigation or criminal proceedings are involved.

Discussion

Where Does All This Information Lead Us?

This research tapped into a great deal of frustration at the local level about fire incident data reporting, as well as a great desire on the part of many fire departments and personnel to improve the job they are doing in reporting causal data. We believe that most departments are truly doing their best. But as we have seen, the reasons behind undetermined and missing data in the causal factors sections of NFIRS are not always straightforward; there are many issues that factor in.

The problem of limited resources factors in at every level of this discussion and is a chronic problem. We understand that volunteer departments, especially, face restrictions on time and money that limit their ability to fight fires, let alone determine their cause and report their cause. And many fires are considered too small to be investigated, especially by departments of all types and sizes with limited resources.

We received a number of comments from fire personnel who assured us that they are not discouraged from determining and reporting a cause; about 30% of respondents to our online survey said that personnel in their department are not discouraged from entering specific fire causes. But there are many fires where a cause is not reported because of a lack of investigation expertise and reluctance to incur liability. We refer to this factor as **the "Litigation Cloud."** Is it realistic to expect this situation to improve in our litigious society, and if so, where to begin? We explore some of the issues in the following sections of this report.

There are also many fires whose cause is determined by investigators who are qualified to make the call, but the "undetermined" label never gets updated in NFIRS for a variety of reasons. In our survey, nearly 40% of respondents reported that such updates occur "sometimes" or "never." We call this the failure to "Close the Loop." The process for updating the NFIRS reports in a given department may vary depending on the software or tool they use to input NFIRS data, as well as procedures that may be in place for who can do the updating, but it is possible to update fire incident reports, even after they have been submitted to the state or to NFIRS. **If departments were to make a greater effort to "Close the Loop" by actively tracking down the investigation reports and making the necessary updates in NFIRS** – and if those who interact with fire departments on incident reporting can help them in that effort -- we expect that this activity could have the largest impact on reducing the high percentage of serious fires with unknown causal data.

We also believe that, within all ranks of the department, **a greater appreciation for and emphasis on the value of data – why it is collected and how it can be used** at all levels of government – would help improve the overall quality of data as well as impact the rate of "undetermined" causes. Here, we make a distinction between completeness of the data entered and the quality of the data. They can both be elements of quality control, but completeness can too often mean "satisfying the computer" that all the required elements have been filled out versus making sure the data entered is accurate and updated. Our research found that the departments with higher levels of data quality tend to have **quality control procedures in place**,

usually spearheaded by one person we call the **Data Champion**. We discuss in a later section of this report the role that Data Champions can play in the quality of NFIRS data. We also talk about the role of the State NFIRS Program Manager in contributing to data quality.

We found in our research that the priority for quality data reporting starts with the Chief and trickles down to all levels of the department. This comment received through our online survey expresses it nicely: "It's a top down approach. The Fire Chief believes in importance of timely accurate reporting. He believes that decisions needed to be made must be based on accurate data and information. In my experience, if it is not a priority for the Fire Chief the results will be mediocre at best."

The need for a greater appreciation of data is prompted by what we are calling **the "Black Hole"** view of fire data, the idea that once the data are input and sent to the state or directly to NFIRS, they are never seen or used again by anyone, therefore, "What's the use?" The Black Hole is illustrated by comments made during our in-depth interviews as well as those we received via our online survey, such as the following:

- "I suspect we're just a very small, very rural department fighting fires that haven't much to do with what NFIRS is collecting data on."
- "It would be an excellent use of my time if I could retrieve the data and use specific statistics for grant apps. Would also use it to review department stats such as response times, use of equipment, and hours on engines. I have been told that the NFIRS system is a 'one way' data collection."
- "After many years in the fire service, I don't see how these reports make a difference for fire prevention and/or public fire education in the fire service. We still seem to focus on fire suppression and not fire prevention."

The "Black Hole" is a persistent myth that we believe can be addressed with education and training. In fact, fire departments "own" the data they submit to NFIRS, though clearly some do not understand how to access the data once it is submitted, or how to analyze it in a meaningful way. NFIRS itself offers a limited set of tools for departments to use to analyze their own data. And among the entities that use fire incident data submitted to NFIRS are states, federal government agencies, private industry, nonprofit fire-related organizations, academic and research institutions, and the media (FEMA "Uses of NFIRS" 1997).

We were gratified to see in our online survey as well as the in-depth interviews that, as strapped as departments are for time and resources, and as much training as they already are required to do, they would by and large welcome **additional training that focuses on data reporting**. Respondents' comments expressed a desire for training that addresses the mechanics of entering the data as well as a broader appreciation of the concepts of why data reporting is important and useful, by way of demonstrating why accuracy and completeness are key. Too many respondents were unaware of the types of training and education currently available to them, but we believe there is also room for new training. As indicated earlier, the NASFM Foundation is currently working on a 2012 Fire Prevention and Safety Grant from the Federal Emergency Management

Agency that will address the "data appreciation" aspect of the puzzle, and we expect to have that available by the third quarter of 2014.

How <u>Should</u> Fire Departments Address Cause Data in NFIRS?

Chapter 3 of the *Fire Protection Handbook®*, Twentieth Edition, in its chapter on "Fire Data Collection and Databases," states the following:

> <u>Cause and Origin Skills Essential Parts of Local NFIRS</u>: *The persons responsible for reporting the data should be trained and capable of investigating a fire to determine the origin, cause, and circumstances of the fire* [emphasis added]. Their determinations become the data used by the system. Weaknesses here can undermine the validity of the data and of any analysis performed on the data.
>
> The fire department should have certain standards that apply to all record-keeping operations. Such standards will help make the data more uniform from report to report and application to application. Standardization aids all users of the data, makes analysis more accurate, and is essential if data is to be automated….
>
> *Updating incident reports is crucial to an accurate fire data system. The updating of incident reports as better or more complete information becomes available is often not done* [emphasis added]. This is a major problem in the quality of information available. The lack of updates is especially common for fatal fires and large-loss fires, for which the initial incident report is left incomplete pending an investigation but does not get updated after the investigation is complete.
>
> Each department should have detailed written procedures explaining how to perform each step in report compilation. These procedures should address such issues as how the reports are to be edited, processed and filed; within what time frame; and how they are to be corrected or updated. Everyone responsible for completing any portion of the report should understand the procedures and schedule for completing, correcting, and forwarding the data. Delays in submitting data will result in delays in assembling the complete report and in making it available for use" (p. 3-47).

If this passage represents the ideal of how fire departments <u>should</u> address cause data in NFIRS, we can confirm that it is not done to this extent in many departments. Expecting the people who are making the data entry to all be capable fire investigators as described in the first paragraph is flatly unrealistic. The lack of resources in most departments to devote to fire investigations and the fact that the least experienced person in the department may well be the one assigned to input fire incident data are just two reasons that the person responsible for reporting the fire incident data is not likely to be trained to the level that the *Fire Protection Handbook* suggests they should be.

On the other hand, the extent to which fire incident reports are not updated after investigations or as more complete information becomes available is a gap that very well could be addressed, if other conditions that feed this problem are also addressed.

NFPA 921: Seeding the "Litigation Cloud"

Whether it was mentioned specifically or indirectly referred to, fire department concerns about the requirements of NFPA 921 Guide for Fire and Explosion Investigations and its perceived impact on fire incident reporting was a strong theme throughout our research. The reluctance to be questioned in court regarding a specific cause determination discourages many departments from coding cause information at all. This reluctance is firmly a part of the fire service culture, and though it clearly does not exist in all departments, it is expressed eloquently in this comment received in our online survey from a volunteer firefighter:

> We are volunteers. Although rare, getting subpoenaed to go to court means time away from our regular job without pay. A civil suit in which a fire department named a specific manufacturer or brand name brings a plethora of emotions and stress on a volunteer who is not an expert fire investigator and never claimed to be one. It's simply not worth the trouble and is easier to enter "Undetermined" and let the insurance investigators, who are getting paid to do the job, determine fire causes. We are doing the best we can for free and we don't want to end up in court, being made to look incompetent and feeling embarrassed in front of a judge, jury, and the public.

This is clearly not a concern that is going to go away by anyone's saying "there is nothing to worry about." Whether NFPA 921 does or does not require absolute certainty in determining cause, the impression is that it does, and in this case, perception has become reality and it appears to be playing out in courtrooms across America.

The issues surrounding NFPA 921's role in fire departments' willingness to determine fire cause are complex and beyond the scope of this research project to sort out. However, in the interest of calling attention to the need for more discussion, clarity, official interpretation and education about the issue, we raise some of the factors that came up in our research that we believe are relevant.

The concern about putting down a cause that may be treated as "absolute" in a court of law predates NFPA 921, which was first issued in 1992. The ABT Associates report from 1982 notes that "Regardless of departmental practices, there is general agreement that officers are reluctant to put down causal information of which they are unsure. One reason given for this is that it can create problems later in court if the information on the incident report is different from other information as to cause" (Rikoski and Rossman, p. 20). A comment from our on-line survey summarizes the fear of liability that continues to this day:

> The 'buzz' word industrywide seems to be if you cannot be 100% then leave it undetermined. And since you were not there when it started, you cannot be 100%. Then the liability 'L' word kicks in.

The use of the scientific method as recommended by NFPA 921 Chapter 4, "Basic Methodology" for fire investigations specifies a systematic process involving the definition of the problem; the collection of data based on observation, experiment or other direct means; analysis of the data; development of one or more hypotheses; and testing of the hypotheses to determine the one that is "uniquely consistent with the facts and with the principles of science. *If*

no hypothesis can withstand an examination by deductive reasoning, the issue should be considered undetermined" (NFPA 921, 2011 ed., Sec. 4.3.6, emphasis added).

Other sections of NFPA 921 go into more detail about the level of certainty required to establish cause:

> 18.7.1 Establishing the Cause. Although cause is common terminology, the investigator should describe it in terms of the competent ignition source providing enough heat to ignite the first fuel, and the circumstances of how they came together.

> 18.7.4 Undetermined Fire Cause. The final opinion is only as good as the quality of the data used in reaching that opinion. *If the level of certainty of the opinion is only 'possible' or 'suspected,' the fire cause is unresolved and should be classified as 'undetermined'* (emphasis added). This decision as to the level of certainty in data collected in the investigation or of any hypothesis drawn from an analysis of the data rests with the investigator.

What, then, does NFPA 921 say about a "probable" level of certainty for a cause hypothesis?

> 18.5 Developing a Cause Hypothesis. … In this case, a separate hypothesis is developed considering each individual competent ignition source at the origin as a potential ignition source. … Potential ignition sources should be eliminated from consideration only if there is reliable evidence that they could not be the ignition source for the fire. …

> 18.6 Testing the Cause Hypothesis. Each of the alternate hypotheses that were developed must then be tested using the Scientific Method. *If one remaining hypothesis is tested using the 'scientific method' and is determined to be probable, then the cause of the fire is identified* (emphasis added).

"Probable" is defined as:

> 4.5.1 … (1) Probable. This level of certainty corresponds to being more likely true than not. At this level of certainty, the likelihood of the hypothesis being true is greater than 50 percent.

But then consider this passage:

> 18.6.5.1 Cause Undetermined. *In the circumstance where all hypothesized fire causes have been eliminated and the investigator is left with no hypothesis that is evidenced by the facts of the investigation, the only choice for the investigator is to opine that the fire cause, or specific causal factors, remains undetermined* (emphasis added). It is improper to base hypotheses on the absence of any supportive evidence….That is, it is improper to opine a specific ignition source that has no evidence to support it even though all other hypothesized sources were eliminated.

Given these passages, it appears that, at best, NFPA 921 is sending mixed messages to the fire service about cause determination. On the one hand, it requires that the level of certainty for a cause determination only be greater than 50 percent, and that "probable cause" is properly determining the cause of a fire in accordance with NFPA 921. On the other hand, it advances a strong argument for leaving a cause "undetermined" if there are insufficient resources to conduct a full and proper investigation that collects an abundance of supportive evidence to prove a

hypothesis. While it seems obvious that basing a conclusion on no evidence is improper, how much supportive evidence is enough?

To the firefighter who is not trained as a certified fire investigator, just trying to do his or her best to complete the incident report for a routine fire, are the words "scientific method" and "supportive evidence" a deterrent to a probable cause determination? Does this language about greater than 50 percent certainty conflict with paragraph 18.6.5.1, much less the rest of the NFPA 921 guide, which goes into copious detail about the minutiae of fire investigation practice to an extent that most fire service representatives have no intent or possibility of achieving? Can a balance be achieved that can serve the need for reasonably reliable data on causes without scaring the fire service into not reporting causal factors at all?

The Chair of the NFPA 921 Committee, Randy Watson, says that a careful reading of Chapter 18 of NFPA 921 should address any questions about certainty when determining fire cause:

> The main point is the investigator needs to be able to prove whatever he claims. There is nothing in the document about 100%. If in the investigator's opinion he has evidence to support his determination as to cause, then he should state it. If the investigator doesn't have evidence to support his determination, then he should indicate what the competent ignition sources are and that he cannot make a definitive determination beyond [the fact that] it is one of the two competent ignition sources identified. The chapter also states that there are times [when] the ignition source is not located but you can still determine an ignition scenario that is consistent with all the known facts (Watson, Randy. December 2-6, 2013. Email exchange with Ed Comeau).

Our research looked into several attempts by the fire service to get out from under what we are calling the Litigation Cloud to a greater or lesser extent:

Permission to be 51% Certain

Several of the fire officials we spoke with during our in-depth interviews were interested in being given "permission" to express in the incident report what in their estimation is probable cause for a fire incident – in the form of some kind of disclaimer or reassurance that 100% certainty is not what is being requested by NFIRS or by NFPA 921. An example of language that addresses the level of certainty expected in fire incident reporting is found in a text box in the Massachusetts Basic Fire Incident Reporting form found in Appendix 10 of this report and at http://www.mass.gov/eopss/agencies/dfs/dfs2/osfm/fire-data/mfirs/forms-for-download.html:

> Entries contained in this report are for the sole use of the State Fire Marshal. Estimations and evaluations made herein represent "most likely" and "most probable" cause and effect. Any representation as to the validity or accuracy of reported conditions outside the State Fire Marshal's Office is neither intended nor implied.

Incident Report ≠ Investigation Report

Some fire officials told us that, in an effort to subdue the anxiety about determining a cause, they make a distinction between the investigation report and the incident report. The distinction is that the incident report (which may be for a fire that did not rise to the level of a full-fledged investigation) is not given the same level of scrutiny as an investigation report and would not need to be subjected to the same rigorous process when determining cause. This might provide reassurance for those departments that put down "undetermined" when the cause is plainly obvious to them out of fear that they are not qualified to make the call.

Origin and Cause Technician Certification

The State of Wyoming runs a certification program for "origin and cause technicians" that addresses the needs of departments that lack the resources to have full-fledged certified fire investigators at their disposal for routine fires. The certification does not fully meet the NFPA 1033 Fire Investigator standard, but provides skills for those who want greater knowledge in Origin and Cause fire investigation that can be applied to relatively straightforward incidents in which the skills of a certified fire investigator may not be needed. (See http://wyofire.state.wy.us/text/training/OCTManual.html for more information.)

Countywide Fire Investigation Teams

In order to share the fire investigation expertise in a given region, and to amplify the knowledge devoted to determining fire causes and prosecuting arsons, countywide or region-wide fire investigation teams (FITS) are being cultivated in different parts of the country. We spoke with the originator of the Anoka County, Minnesota, FIT, Chief Jerry Streich of Centennial Fire District, to learn about how these teams operate. Anoka County's FIT consists of 25 trained and certified investigators from around the county, including representatives from the fire service, law enforcement, the county attorney's office and the county coroner's office. Funded primarily from grants and donations from local organizations and dues from participating communities, FIT members assist the local jurisdictions in the county with investigations or take the lead on the investigations if a department does not have the resources to do it themselves. Rather than leaving the fire cause determination up to a single person, a combination of strengths and experience is applied to each fire investigation, and the collaboration has been remarkably effective in Anoka County; since the FIT was first set up 2008, arson convictions have increased by 33 percent within the county. Chief Streich says the keys to a successful FIT include the participation of law enforcement and mutual aid partners, a common mission to protect the community, procedures, insurance, and the basic tools of fire investigation. (Interview by Karen Deppa with Chief Jerry Streich, Centennial Fire District, Minnesota, October 2013.)

Immunity from Liability for Reporters of Fire Incidents

We found a few states that provide immunity from civil (and in one case, also criminal) liability for the person/entity that provides written fire incident reports to the state:

Kansas

Kansas 2012 Statutes Online

http://kslegislature.org/li/b2013_14/statute/

K.S.A. 31-404(b)(e) provides that "any individual who provides information to an authorized agency, whether oral or written, concerning the damaging of any building or property by fire shall be immune from any liability arising out of a civil action by reason of providing such information."

New Hampshire

Revised New Hampshire Statutes Online:
http://www.gencourt.state.nh.us/rsa/html/indexes/search.html
TITLE XII PUBLIC SAFETY AND WELFARE

154:1-d Fire Department Liability; Public Duty Rule; Status of Firefighters. –
II. Any firefighter, paid or volunteer, who is acting in an official capacity under the direction or supervision of the elected or appointed fire chief, or designee, of a municipal fire department organized in accordance with RSA 154:1, or who is participating in a fire department activity sanctioned by the local governing body or its designee, shall be an agent of the municipality, enjoying the same privileges and immunities as the municipality or employees of the municipality. Such privileges and immunities include, but are not limited to, indemnification for civil rights damages to the extent set forth in RSA 31:106, and indemnification for any other accidental damages to the extent set forth in RSA 31:105, if the municipality has adopted that section.

153:13-a Fires of Suspicious Origin. –
IV. In the absence of fraud or malice, no public official or insurance company or person who furnishes information on its behalf, is liable for damages in a civil action or subject to criminal prosecution for any oral or written statement made or any other action taken that is necessary to supply information required pursuant to this section.

Tennessee

Tennessee Code Annotated Online:

http://www.lexisnexis.com/hottopics/tncode/

68-102-111. Assistants to investigate every fire Reports Demolition of structures beyond repair.

(a) The assistants to the commissioner, as provided in §§ 68-102-101 68-102-110, shall investigate the cause, origin, and circumstance of every fire occurring in any city or place in this state by which property has been destroyed or damaged, and so far as it is possible, determine whether the fire was the result of carelessness or design. The investigation shall be begun immediately upon the occurrence of the fire by the assistant in whose territory the fire has occurred, and if it appears to the officer making the investigation that the fire is of suspicious origin, the commissioner shall be immediately notified of the fact. Every fire so occurring shall be reported, in writing, to the commissioner, within ten (10) days after the occurrence of the fire, by the officer so designated, in whose jurisdiction the fire has occurred. The report shall be in the form prescribed by the commissioner and shall contain a statement of all facts relating to the cause and origin of the fire that can be ascertained, the extent of damages and the amount of insurance on the property, and such other information as may be required. *A person or entity that reports information in accordance with this section is immune from civil liability for reporting such information; provided, that the person or entity acted in good faith and without malice.* [emphasis added]

When the Tennessee provision took effect in 2004, the Commissioner of the state Department of Commerce and Insurance sent a bulletin to all fire departments in the state with the following message:

> In May, the Tennessee General Assembly approved a bill clarifying that fire departments, their employees and volunteers cannot be held liable for information provided to the TFIRS/NFIRS database in good faith and without malice.

> This clarification was needed to eliminate any hesitance among fire officials regarding TFIRS reporting, particularly in reporting the suspected cause of a fire incident.

> The Fire Marshal's Office has found that some Tennessee Fire Departments have been reluctant to report a suspected cause of a fire, fearing that the report could become the basis of a lawsuit. While we believe that fear was unfounded, we sought this clarification to remove all doubt.

> It is extremely important that all Tennessee fire departments report to TFIRS – accurately and fully. We are analyzing TFIRS data to determine how we can best lower Tennessee's high rate of fire death. Without the data on suspected cause, TFIRS can't give use the information we need to fight fire death. ("Bulletin: Law Change will aid TFIRS reporting" 2004)

While we support the intent of the various efforts described above, it is hard to imagine that any of them is enough to alleviate the fire service's concern about becoming involved in civil or criminal litigation, given the time and inconvenience of being subjected to a deposition under oath and being subpoenaed for testimony at trial, as described by the online survey comments of the volunteer firefighter quoted at the beginning of this section.

<u>Time to Address the Litigation Cloud Head-On</u>

As long as such a lack of clarity exists regarding the level of certainty required to make a fire incident cause determination, along with the potential of lawsuits and associated hassle if a firefighter is called to testify on the basis of a cause identified in a fire incident report, we cannot blame those who take an abundance of caution on the question. At the same time, as long as such conditions exist, the real "nut" of the problem of too many undetermined causes won't truly be cracked, and the culture of fear that has developed will continue to persist.

Because we are not the official arbiters and interpreters of NFPA 921, we call on the NFPA 921 committee to help out the fire service rank and file with communications and interpretations that clarify the questions and provide a link between the process of filling out an incident report with causal factors data and the perceived need to comply with the guidance of NFPA 921. This should be accompanied by discussions, workshops, symposia and educational materials on the larger question of liability and the litigiousness of society that will help to shed more light on the Litigation Cloud that hinders the reporting of causal factors in NFIRS.

State NFIRS Program Managers Can Be a Key Resource in Data Quality - But State-Level Management of NFIRS Varies Widely from State to State

Through the research conducted for this project, we confirmed the importance of having an NFIRS Program Manager within the State Fire Marshal's Office or elsewhere within state government to interact with fire departments about the fire incident data they collect and report. State NFIRS Program Managers issue fire department identification numbers (FDIDs) to fire departments to enable their participation in NFIRS, support the efforts of fire departments that participate in the system, manage the state system, provide quality control and feedback to the departments in their state, and encourage the participation of non-reporting departments.

[Note: State-level fire incident reporting systems are often designated by the first letter or abbreviation for the state, to distinguish it from the national reporting system. Thus, it is called CFIRS in Connecticut; FFIRS in Florida; IFIRS in Idaho; OFIRS in Ohio; MFIRS in Massachusetts, Minnesota and Maryland, but MEFIRS in Maine; NHFIRS in New Hampshire; TEXFIRS in Texas; VFIRS in Vermont; and so on.]

State NFIRS Program Managers can have a tremendous positive impact on the quality of data submitted by fire departments by providing such assistance as providing guidance on coding questions, flagging incomplete or inconsistent responses in submitted data, offering other types of feedback, conducting training classes on reporting, helping fire departments to analyze their local data, and performing state-level data analysis. Fire departments that want to improve the quality of their incident reporting would do well to make a call to their State NFIRS Program Manager, if your state has one. Contact information for State NFIRS Program Managers can be downloaded from the NFIC website at http://www.nfic.org/membership__contacts.html.

There is, however, a wide disparity from state to state in how NFIRS reporting is managed, what assistance is provided to departments and, related to that, the amount of time State NFIRS Program Managers can devote to this portion of his or her job. Some states have the resources to devote several full-time staff to fire incident data collection, while others have no role in fire incident data collection – with most states falling in-between. Based on a request for information from State Fire Marshals about whether their state had a dedicated NFIRS Program Manager and the percentage of time that person was able to devote to that portion of the job vs. other responsibilities, we received the following responses (we emphasize that this is a summary of the responses we received. If a state is not listed, it means only that we did not receive a response from that state):

State	Dedicated NFIRS Program Manager?	Percentage Time Dedicated to NFIRS Reporting (approximate)	Additional Comments from Respondent
Alabama	Yes (Assistant State Fire Marshal)	10%	

National Association of State Fire Marshals Fire Research & Education Foundation

State	Dedicated NFIRS Program Manager?	Percentage Time Dedicated to NFIRS Reporting (approximate)	Additional Comments from Respondent
Arizona	No		The State Fire Marshal assigns fire department identification (FDID) numbers to fire departments in accordance with the U.S. Fire Administration; all departments in the state that report to NFIRS do so independently
California	Yes (Associate Government Program Analyst and Staff Services Analyst)	Both 40%	Associate Government Program Analyst helps develop policies and outreach/training programs related to statewide incident reporting as well as use, operation and maintenance of the statewide system. Staff Services Analyst works with fire departments, processes incident reports, and develops reports based on the data
Florida	Yes (FFIRS Program Supervisor)	100%	Also two other staff assistants are fully devoted to the program
Kansas	Yes (Research Analyst 1)	80%	Person also responsible for collection, entry and analysis of Kansas Insurance Loss reports, Kansas Fireworks Injury Loss reports and Kansas Burn Injury reports; responsibilities recently juggled to work more with local departments to improve NFIRS reporting
Maine	Yes (Senior Planning and Research Analyst)	15%	

State	Dedicated NFIRS Program Manager?	Percentage Time Dedicated to NFIRS Reporting (approximate)	Additional Comments from Respondent
Minnesota	Yes	100%	Supported by a Data Administrator (the Information Technology person on staff) who spends 50-75% of the time working with local fire departments to get on the state-level reporting system and help them get reports out of the system
Montana	Yes	10%	
Nebraska	Yes (Human Resources Manager)	25%	Another person on staff also spends about 25% of the time on state NFIRS reporting
New Hampshire	Yes (Deputy Fire Marshal)	10%	Supported by Data Control Clerk III
New Jersey	Yes (Inspector of Fire Safety, Program Specialist 2, Program Specialist 4, and Technical Assistant)	All 100% except Technical Assistant, who is 75%	The Inspector and two Program Specialists work with local departments on data accuracy, follow up on special studies and fatalities and provide technical assistance to the state reporting system; the Technical Assistant reviews submitted data for errors
Oklahoma	Yes	Less than 5%	
Oregon	Yes	90%	Supported by a Research Analyst and two Administrative Assistants. The Data Collection and Research Unit provides technical assistance and training to local fire departments as well as ongoing quality checks and analysis of submitted data

State	Dedicated NFIRS Program Manager?	Percentage Time Dedicated to NFIRS Reporting (approximate)	Additional Comments from Respondent
Washington State	No		The State lost funding to support NFIRS reporting in 2011; prior to that, a full-time Program Manager worked in the Office of State Fire Marshal. The State Fire Chiefs Association has been administering the NFIRS program since then, and fire departments submit incident data directly to NFIRS

The incidence of State Fire Marshals' offices losing the authority and/or resources to serve as State NFIRS Program Manager is a troubling development that is no doubt contributing to a decrease in the overall quality of NFIRS data reporting in those states. We encourage states that have dedicated staff to devote to NFIRS program management to share their experiences with other states, with the goal of increasing the overall resources devoted to this activity in every state.

Got a Data Champion in the House? Hang Onto That Person!

Some individuals who are responsible for inputting fire incident data into NFIRS for their department address the job with more enthusiasm than their colleagues, along with a strong desire to get it right as opposed to just getting it done. We are calling these people "Data Champions."

- While they share many of the frustrations expressed widely about the system, they also have a generally positive attitude about the NFIRS system, have patiently worked through many of the questions and problems they have encountered, and have gotten to the point where they have gained a level of comfort with the reporting process.

- They are clearly "into" reporting and supplement any formal training they receive with a determination to improve their reporting skills by doing more reading and asking questions of any knowledgeable resource they can locate, including their State NFIRS Program Managers.

- They seek out constructive feedback and learn from their mistakes.

- They are technology savvy and tend not to be intimidated by complex software programs.

- They not only appreciate the reasons that reporting is necessary, but don't mind digging into that notorious 3-inch code book to understand the nitty-gritty of the system. In the case of volunteer departments, the Data Champion might devote considerable amounts of his or her free time to this endeavor.

- They serve as the main quality control for the department's data reporting; they work with their colleagues to clear up questions about incidents, and ensure that incident reports are updated when new information becomes available.

- They also contribute to the analysis of their department's data, and produce reports that are used internally to justify budget requests, allocate resources and identify trends.

In short, Data Champions see their reporting responsibility as a more of a "calling" than just another one of their many jobs in the department. These individuals are just as likely to be from the firefighter rank and file as an administrative position. And in our observation, they are a key characteristic of departments that have good reporting practices and high Data Quality rankings. They may not feel any more comfortable than their colleagues about defining a cause, but they could be the crucial factor in enabling a department to "Close the Loop" on reports when investigations are completed.

Are Data Champions born or made? We did not explore that question in our research, but it is worth asking. Those who have a natural interest in data might volunteer to take on the task for their department. For others who are assigned the job, the enthusiasm might grow as they gain

more training and confidence. Smaller departments that have few incidents to report in a year might consider getting together (as they do for mutual aid) and sharing a Data Champion.

The cultivation of Data Champions could be a key role of the National Fire Information Council (NFIC), and is one of the compelling reasons that NFIC should be infused with federal government funding and a revitalized agenda that would reverse its current moribund status.

We invite additional ideas on how departments have found and developed Data Champions.

The Next-Generation of NFIRS: It's Time

Historically, when a new version of NFIRS was introduced, work on the next version started almost immediately, and each subsequent version took several years of development. Currently, nothing is in the pipeline as far as federal government plans for an NFIRS 6.0, and it has been almost 15 years since 5.0 was introduced. Annual minor tweaks to the NFIRS 5.0 system have taken place, but our research indicates that it is time to begin implementation of a full-on overhaul that addresses the frustrations and needs expressed by users of the current system (those who input the incident reports as well as those who analyze the collective data), takes advantage of advances in technology (consider the enormous developments in computers, the Internet and the way the two interface with each other), and reflects changes in the firefighting environment in this country.

Comments from our in-depth interviews and online survey alike expressed exasperation with the lack of user-friendliness of the current NFIRS system. The issues ranged from the general to the very specific.

Code confusion was a very common concern. While many departments use to good effect what they refer to as "cheat sheets" or quick reference guides for commonly used codes as a way of completing incident reports more quickly, others are aware of practices that essentially aim to avoid codes that lead to additional questions in order to complete the report quickly. This was expressed several comments received in our online survey, for example: "Some officers become familiar with coding incidents so that they will have the minimum amount of work to do with their report. They will select the most general options in order to avoid any effort on their part." Some departments reported dropping out of NFIRS altogether because of the lack of user friendliness.

Most respondents reported doing their best to try to find the "right" code, but often without satisfaction. We were initially confused by the seemingly conflicting sentiments we heard in our in-depth interviews that there were either too many codes or not enough codes: Which was it? Comments we received from the on-line survey made the concern more clear: The feeling is that there are too many codes that are *not relevant* to the incidents that fire departments are encountering, and not enough codes that *are* relevant to today's situations. This was particularly expressed in the case of rural fire departments, where respondents were often at a loss to find the codes that fit their situations. This often resulted in the same incident being reported differently depending on who in the department was inputting the codes, or in the reporter of data "making the fire fit the code," rather than the other way around.

Here are some comments reflective of the frustration about relevance and code confusion:

- "Every day calls such as burnt food are not part of the code. But a nuclear accident is."
- "There are codes for a plane crash in a tunnel but [try finding] a code for a mulch fire or a rekindle."
- "Because what actually happened and what the system will accept never seem to match anyway, we keep the actual action on paper, and only update the system on what it will accept."

- "The most common complaints I hear are that there are too many codes, it takes too long to identify the best code and there is inconsistency between individual company officers coding the same type of incident."
- "There are insufficient codes for property use; rural gravel or blacktop roads vs. paved roads; a grain bin vs. silo; an on-farm corn dryer vs. a commercial grain drying facility. Ambiguity is rampant regarding rural properties."
- "Figuring out the codes the system will take, you have to lie or fib on the codes for the computer system to accept the report."
- "Most rural incidents are harder to select for than urban situations. A harvested, but untilled corn field is different than one that has been fall-tilled; stalk residue has value as livestock feed and can be baled. The grain is already harvested. Different parameters are involved."
- "There are so many codes yet some are applicable and some are not. Our software does not allow for user friendly means of searching codes or better defining OTHER codes."
- "It can be difficult to determine the intent behind some the codes. Knowing the intent might help the choice of code eventually chosen."

Other comments that came up frequently focused on software-related problems (which may refer to NFIRS directly or to problems with third-party vendor software). For example:

- "It takes way too long to put in the names of responders. Why can't we just click on them from a list – we already have the roster in the program." (Note: USFA staff informs us that this complaint is no longer applicable to users of the USFA DEBI system.)
- "Code descriptions must be expanded manually each time to get the entire line of text."
- "Critical Validation warnings from NFIRS. These are usually not our fault and have to do with the NFIRS format and the way it allows us to use it. It has gotten to the point that [if] it is a critical warning, we just let it go through because it is such a pain to correct."
- "This is a pain because our password expires making it a hassle to log in. We/I think that is a problem with the system and it should be made more user friendly. It makes it difficult for people to use it when they have spare time and fewer and fewer are doing so leaving it up to me and my dispatch officer. We are volunteer and don't want to waste our time setting up a new password every time we log on just because it was over 30 days since our last time in the system." (Note: USFA staff informs us that the Department of Homeland Security governs the password rules, not NFIRS; the time between password changes is 60 days.)
- "I have to enter my name, rank and radio call sign three times in different places. It would help (save precious time) if I could enter my call sign and the software would

populate the appropriate fields from a database for us. Why not enter a zip code and have city and state automatically populated?"

- "Alphabetizing would be a good start! Also, seems to be a lot of grey areas. Automobile, pickup, other...other? 'Other' could be a billion things."
- "Need HELP screens for code definitions."
- "The program seems antiquated and not a user friendly interface. It's like working with old DOS programming. Update the interface and update to be more compatible with new operating systems and current interfaces like Quicken or other data entry programs. Interfaces we use every day, PLEASE."

We do believe that the professionals who run the NFIRS system at the U.S. Fire Administration are doing the best they can with the resources they have; in fact, in the process of participating on the Advisory Committee to this research project, the USFA's National Fire Data Center (NFDC) staff were on the lookout for ways that in the short term they could address some of the concerns expressed in our report. Similar to the situation faced by many fire departments, the fire incident data system at the federal level has suffered due to lack of resources. The budget recommended by *America Burning* for funding the National Fire Data System in its first year of operation was $3.740 million (American Burning 1973, p. 141). Today, the NFDC has a staff of four dedicated to NFIRS data collection and user support. In addition, the NFDC has three statisticians dedicated to analyzing NFIRS data. The annual NFIRS budget to support all NFIRS functions and contracts, not counting salaries, is approximately $2.5 million (email from Brad Pabody, NFDC, to Karen Deppa, Dec. 20, 2013). To put this in perspective, $3.740 million of 1973 dollars would be worth about $19.684 million in 2013; and $2.5 million of 2013 dollars would be worth about $475,000 in 1973. (www.usinflationcalculator.com)

Taken together, these comments suggest that the "system" is not receiving high-quality data as a result of frustrations that could be addressed with an upgrade to the system. Given that the process leading to a next-generation NFIRS will necessarily take years, additional research, broad participation, and an influx of funding and other resources that depend on funding, we believe it is time to convince the federal government to put this on their radar screen and take steps to move forward with NFIRS 6.0.

Identified Gaps/Problems and Associated Recommendations

Based on our research, we have identified five gaps/problems that are creating barriers to more complete reporting of fire incident data, and have paired each gap/problem with corresponding recommendations and strategies with which the recommendations could be met. Some of them may be easily implemented; others will require commitment, effort – and substantial funding – to carry out. Further, these suggestions are presented with the understanding that one size does not fit all, and that the best level(s) at which to carry out a particular strategy (whether the local, state, regional or national level) will depend on the strategy itself. These strategies are intended to be a starting point for further discussions and idea generation for how to address these problems and carry out the recommendations.

- **Problem: Available information about investigated fires (often those that result in greater loss) is too often not included or is underreported in NFIRS.**

    Recommendation 1: Close the Loop. Whether a cause is determined or remains undetermined after investigation, fire departments must "Close the Loop" by updating the codes in the NFIRS incident report. Simply attaching the investigation report to the incident report does not allow for the causal information to be included in NFIRS analyses -- the codes need to be updated in the system once a cause is determined. "Under Investigation" reports should always be revisited and updated after the investigation.

    Possible strategies to "Close the Loop:"
    1a: Designate someone who is responsible for quality control and to review incidents with "Unknown" or "Undetermined," who will follow up to see if there is additional information to be entered or if the incident reports are as complete as they are ever going to be and can be closed out.

    1b: Dispel the misconception that a report that has already been submitted to the state or directly to NFIRS cannot be updated in the NFIRS system – and provide instructions for how departments can do this.

    1c: Provide investigators with NFIRS access information to enable them to update fire incident data reports.

    1d: Designate one person in the department to be responsible for updating the fire incident data report after an investigation is complete.

    1e: States that complete investigations for local departments should send a copy of the final report to the department and work with them to ensure that the NFIRS report is updated.

    1f: Enable a direct link between the NFIRS and other databases used by the fire department (such as the Bomb Arson Tracking System), so fire departments can streamline their data entry and not have to enter or update the same data in multiple systems.

- **Problem: Some incomplete data for cause and origin reflects a hesitation to declare a cause due to liability concerns.**

  Recommendation 2: **Clear the Litigation Cloud.** Address the liability concerns through a multi-pronged approach.

  2a: Provide an option of indicating a level of certainty that underlies causal determinations.

  2b: Inform those instructions with a formal interpretation of NFPA 921 Guide for Fire and Explosion Investigations to clarify levels of certainty for determining cause of different types of fire incidents.

  2c: Provide immunity from liability for persons or entities who report fire incident data while acting "in good faith and without malice."

  2d: Explore whether incident reports and investigation reports are treated differently in lawsuits and courtrooms, to clarify the question of whether it makes sense to draw a distinction between the two types of reports in terms of determining cause.

  2e: Consider forming a "brain trust" of trained fire investigators in the form of a region- or countywide Fire Investigation Team to share expertise and resources, and to collaborate on fire investigations rather than leaving the fire cause determination up to a single individual.

- **Problem: NFIRS training is not effectively conveying to front-line firefighters the importance of data collection. A common sentiment expressed was that NFIRS reports end up in a "Black Hole."**

  Recommendation 3: Fill the Black Hole. Training for chiefs, officers and front-line personnel on the concepts and reasons behind the need for reporting, as well as how fire incident data can be used to advance fire prevention and suppression goals is needed. Because the fire service devotes a great deal of time to training, alternative training formats (such as on-line, video, smartphone applications) should be explored. And wherever possible, the training should be offered at no cost.

  As a direct result of the preliminary findings of this project, NASFM was awarded a subsequent DHS Fire Prevention and Safety Grant to develop training material for firefighters and chief officers regarding fire incident reporting. This training will focus on the value and importance of data, not the mechanics of doing the data entry. The training will be offered to fire departments at no cost, and is expected to be made available in the second half of 2014.

- **Problem: The current NFIRS system is viewed as overly complex and not user-friendly.**

  Recommendation 4: If the System Is Broke, Fix It. Develop and implement the next generation of NFIRS (what is commonly referred to as NFIRS Version 6.0). This process should include input from stakeholders – those who are tasked with inputting the data at the local level, as well as those who analyze and use the data at all levels. It should take advantage of modern technology and accommodate the diversity of fire departments' capacities.

  Features and characteristics to consider in the redesign:

  4a: Codes that reflect the incidents that modern fire departments – urban, suburban and rural – face. Consider fewer codes that capture broader categories and include optional narrative text fields to add detail.

  4b: Simple, user-friendly design.

  4c: Option for electronic field reporting and other features that take advantage of modern technology such as smart phones and tablets.

  4d: Examples of model reports for different types of incidents.

  4e: An option for a "Turbo-Tax"® style interviewing program to walk fire personnel through the process of completing an incident report.

  4f: Requiring causal factors to be reported for outside rubbish fires and confined fires.

  4g: Standardized software language that all software vendors must use as the basis for their NFIRS-compliant programs.

  4h: A process to certify all software vendors as NFIRS-compliant rather than allowing self-certification of vendors.

  4i: Rigorous testing of redesign for validity, reliability, and use-ability.

  4j: Clear instructions for how departments can get their own data back out of the system in the form of reports, as well as model "user" reports for various situations.

- **Problem: Protocols and systems to improve Quality Assurance and Quality Control in fire incident reporting are needed.**

  Recommendation 5: Put In Quality Data, Take Out Quality Data.

  This is the antidote to "Garbage In-Garbage Out." Specific systemic changes to improve quality assurances and quality control include:

  5a: Designate one person in the department as responsible for NFIRS quality control/quality assurance. This designee should be detail oriented, appreciate the importance of NFIRS, and

enthusiastic about his/her role in maximizing NFIRS impact. We refer to this person as the "Data Champion."

The Data Champion could be a firefighter or a non-firefighter, as long as that person is willing to learn and understand the details of filling out the incident reports with the proper codes, interview the incident commanders about incidents, ensure that data is input accurately and consistently, and update reports as needed. This person may be particularly important for departments that have fewer than 25 fires a year, since a lack of practice in inputting data can result in inconsistencies and errors.

5b: Provide a mechanism for departments to report "no incidents" periodically to address questions about whether they are failing to report incidents.

5c: Emphasize the importance of dedicated State NFIRS Program Managers to work with departments in their state, provide examples of good reporting and perform quality control oversight.

5d: Adopt a Standard Operation Procedure or Standard Operating Guideline (SOP/SOG) on completing incident reports and review it regularly with personnel. This document, at a minimum, should address: Why data collection is important; who is responsible for inputting the incident data; the basics of report writing and the importance of accuracy; when reports must be completed; procedures for quality control; procedures for updating the report when additional information is obtained; and references for additional information. (See Appendix 9: Model for Standard Operating Procedure, Incident Reporting [Pennsauken, NJ].)

5e: Revitalize the National Fire Information Council (NFIC) with a focus on developing strategies and training to improve the quality of the nation's NFIRS data. A closer structural connection between NFIC and the National Association of State Fire Marshals (NASFM) might be considered, given the high percentage of NFIRS Program Managers that are based in State Fire Marshal offices.

Closing Thoughts

While NFIRS is an imperfect system, to be sure, it is what we have as documentation of the fire problem in the United States, and it is better to have it than not. It behooves all of us to work toward improving the system, as well as our appreciation of the need for data collection, and the accuracy with which reports are completed.

We acknowledge that there is a natural tension between NFIRS as a research endeavor and the amount of data wanted by data analysts (which is always "more"), and NFIRS as a public record documenting a specific incident and the amount of data that fire departments are willing to give or believe is needed (which tends to be "less"). That balance may have gotten out of kilter in recent years, but the balance is worth regaining.

There will always be fires whose cause cannot legitimately be determined even after investigation. We further caution that a policy that says "Thou shalt not have unknowns" would do much more harm than good, and we would never recommend such an approach. Nobody should feel pressure to determine cause just for the sake of checking a box; putting in the wrong data would be much worse than putting in "undetermined."

For many incidents, however, we believe that definite steps can be taken toward reducing the level of "undetermined" or unreported responses in the causal factors section of NFIRS. To achieve this will require confronting some difficult, thorny issues that do not have clear solutions. But, *If you don't write it down, it didn't happen,* and we may never be able to quantify what has been lost by not having sufficient data on the causes of fires. As one of our responders commented, "If a fire department is not reporting this data, they are hurting the fire service. We need all departments to report this data. Without it, we have nothing to support why fire departments, firefighters, EMS personnel are needed."

References

Ahrens, Marty. April 2013. "U.S. Home Structure Fires." Quincy, MA: National Fire Protection Association Fire Analysis and Research Division.

Ahrens, Marty, Patricia Frazier and Gayle Kelch (Revisers). 2008. "Use of Fire Incident Data and Statistics." In *Fire Protection Handbook®*. Twentieth Edition, edited by Arthur E. Cote, P.E., 3-61 – 3-92. Quincy, MA: National Fire Protection Association.

Ahrens, Marty, and Stan Stewart. 2008. "Fire Data Collection and Databases." In *Fire Protection Handbook®*. Twentieth Edition, edited by Arthur E. Cote, P.E., 3-61 – 3-92. Quincy, MA: National Fire Protection Association.

"Bulletin: Law Change will aid TFIRS reporting." September 2004. State of Tennessee, Department of Commerce and Insurance. http://www.tn.gov/fire/documents/Tfrisliability.pdf.

Davidson, Robert J. November 25, 2013. ePARADE Yahoo Group post, "Re: America's 'grossly underreported' arsons hide public safety threat." http://groups.yahoo.com/neo/groups/EPARADE/info.

Federal Emergency Management Agency, U.S. Fire Administration, National Fire Data Center. October 2009. *Fire in the United States 2003-2007*. Fifteenth Edition.

Federal Emergency Management Agency, U.S. Fire Administration, National Fire Data Center. October 2012. *Intentionally Set Fires in Residential Buildings (2008-2010).* Topical Fire Research Series. Volume 13, Issue 10.

Federal Emergency Management Agency, U.S. Fire Administration, National Fire Data Center. February 2006. *Investigation of Confined Structure Fires.* Topical Fire Research Series. Volume 5, Issue 8.

Federal Emergency Management Agency, U.S. Fire Administration, National Fire Data Center. January 2013. *National Fire Incident Reporting System 5.0 Complete Reference Guide*. http://www.nfirs.fema.gov/documentation/reference/NFIRS_Complete_Reference_Guide_2013.pdf.

Federal Emergency Management Agency, U.S. Fire Administration, National Fire Data Center. November 2007. *National Fire Incident Reporting System Program Management Student Manual* (NFIRS PM-Student Manual). 3rd Edition, 1st Printing.

Federal Emergency Management Agency, U.S. Fire Administration, National Fire Data Center. June 1997. *Uses of NFIRS: The Many Uses of the National Fire Incident Reporting System.* http://www.usfa.fema.gov/downloads/pdf/publications/nfirsuse.pdf.

Hargrove, Thomas. November 2013. "Arson in America: America's Largest Known Arson Conspiracy." Scripps Media, Inc.

Hargrove, Thomas. November 2013. "Arson in America: What's the Alarming Reality?" Scripps Media, Inc.

Karter, Michael J., Jr., and Gary P. Stein. October 2013. "US Fire Department Profile 2012." Quincy, MA: National Fire Protection Association Fire Analysis and Research Division.

Kinsey, Karyl A., Ph.D. May 2012. Email correspondence with Marty Ahrens. Austin, Texas, Fire Department Planning & Research Section.

Krueger, Joseph L. October 2010. "Garbage In? Evaluating the Consistency of the Data Input in the MTFPD NFIRS Compliant Database." Emmitsburg, MD: National Fire Academy Executive Fire Officer paper.

Miller, David. July 2013. "2009-2011 Residential Fire Loss Estimates: U.S. National Estimates of Fires, Deaths, Injuries and Property Losses from Unintentional Fires." Bethesda, MD: U.S. Consumer Product Safety Commission.

National Burn Repository 2013 Report, Version 9.0. American Burn Association: National Burn Repository® 2013.

National Commission on Fire Prevention and Control. May 1973. *America Burning*. Washington, DC: http://www.usfa.fema.gov/downloads/pdf/publications/fa-264.pdf.

Negrete, Troy A. April 2009. "Analyzing Risk." Emmitsburg, MD: National Fire Academy Executive Fire Officer paper.

NFPA 921: Guide for Fire and Explosion Investigations. 2011 Edition. Quincy, MA: National Fire Protection Association.

The President's Conference on Fire Prevention. May 1947. *Action Program*. Washington, DC: http://www.usfa.fema.gov/about/47report.shtm.

Public Law 93-498. Federal Fire Prevention and Control Act of 1974. As Amended Through P.L. 112–239, Enacted January 2, 2013.

Quick, Victoria L. November 2011. "Garbage In, Garbage Out: An Evaluation of the National Fire Incident Reporting System (NFIRS) Training in the Orange County Fire Rescue Department (OCFRD)." Emmitsburg, MD: National Fire Academy Executive Fire Officer paper.

Rikoski, Giannina P., and Henry H. Rossman. September 1982. "A Pilot Study of Unknown Cause Fire Incidents in National Fire Incident Reporting System (NFIRS) Data: Final Report." Submitted to the Federal Emergency Management Agency. Contract No.: EMW-C-0628. Washington, DC: ABT Associates, Inc.

Smith, Mark V. August 2007. "Determining NFIRS Reporting Accuracy by Alachua County Fire Rescue Company Officers." Emmitsburg, MD: National Fire Academy Executive Fire Officer paper.

Stefancic, Josh M. October 2011. "NFIRS Data Entry Analysis." Emmitsburg, MD: National Fire Academy Executive Fire Officer paper.

Steputat, Linda. April 2009. "Determining Criteria for the Development of a Fire Report Writing Guideline." Emmitsburg, MD: National Fire Academy Executive Fire Officer paper.

Van Nest, Dean W. December 2009. "Evaluation of the City of Alice Fire Department Fire Reporting System." Emmitsburg, MD: National Fire Academy Executive Fire Officer paper.

Appendixes

Appendix 1:   Examples of Field Notes Forms from State Fire Marshal offices
1a: New Hampshire
1b: New Jersey

Appendix 2:   List of Advisory Committee Members

Appendix 3:   Biographies of Executive Team Members

Appendix 4:   Definition of NFIRS Data Quality Rating Criteria Methodology

Appendix 5:   Question, In-Depth Interviews of Fire Department Personnel

Appendix 6:   Questions, Online Survey of Fire Department Personnel

Appendix 7:   Questions, Interviews of Administrators of Data Systems in Non-Fire Professions

Appendix 8:   Electronic Toolkit of free and low-cost resources to assist with NFIRS data reporting and analysis and entry-level instruction on origin and cause determinations
8a: E-Book Format
8b: Table Format

Appendix 9:   Model for Standard Operating Procedure, Incident Reporting [Pennsauken, NJ]

Appendix 10: Massachusetts Basic Fire Incident Reporting Form (Example of Language Regarding Level of Certainty Expected in Fire Incident Reporting)